

INDEPENDENT DRIVE TEST REPORT

For

Dhanbad

Aug 2017

EAST ZONE

Key Performance Indicators: All TSPs have met the Call Setup Success Rate (CSSR) of 95% & only 43% of the TSP have met the Call Drop Rate (CDR) benchmark of 2%

The Independent Drive Test has been carried out by M/s PhiMetrics Technologies Pvt. Ltd. on behalf of TRAI in Dhanbad City & adjoining areas from 9:00 AM to 9:00 PM; 7th Aug to 11th Aug 2017. The drive test covered a drive route of approximately 659 KMs and 6 hotspots over a period of 5 days. Approximately 900 calls were made for each of the 16 networks: eight 2G networks, six 3G networks, one CDMA and one LTE network covering 9 unique TSPs

Overview

Voice Summary

Data Summary



Overview

Overview:

Telecom Regulatory Authority of India has been entrusted with the task of laying down the standards of quality of service to be provided by the service providers and ensuring its enforcement; and also TRAI is responsible for conducting the periodical audit of such services provided by the service providers so as to protect the interest of the consumers of telecommunications service.

TRAI is regularly monitoring the performance of Telecom Service Providers (TSP) against the benchmarks for the various Quality of Service (QoS) parameters laid down by the Authority. TSPs submit Performance Monitoring Reports to TRAI every quarter. TRAI also undertakes audit and assessment of Quality of Service through independent agencies to verify the Quality of Service claimed. The Audit agencies conduct sample 'Drive tests' across various cities in the country as part of audit and assessment of the TSPs' performance.

In view of complaints on call drops and other network quality issues, on behalf of TRAI, an Independent Drive Test (IDT) was conducted by PhiMetrics Technologies Pvt. Ltd. from 7th Aug to 11th Aug 2017 covering various locations in Dhanbad City & surrounding region. The performance of **Aircel, Airtel, BSNL, Tata, Idea, RCOM, Vodafone, Telenor and Jio** was monitored across various technologies (2G, 3G, 4G and CDMA). The drive test route was defined on the basis of several factors that include - areas from where call drop complaints are commonly received; areas of heavy usage; residential areas away from arterial roads; office areas; areas where previous Drive tests showed network issues; etc.

The test results obtained from these drive tests were utilized to assess the network quality for Voice and Data services in terms of **Voice**: Coverage; Quality; handover Success Rate; Call Setup Success Rate; Call Drop Rate; Block Call Rate.

Data: Download and Upload Throughputs, Web Browsing Delay, Video Streaming Delay and Latency

Drive Test Details For Dhanbad:

Independent Drive test was conducted for a period of 5 days from 7th Aug to 11th Aug 2017 in Dhanbad city & surrounding areas from 9:00 AM to 9:00 PM. Calls were made for 90 sec duration with wait time of 10 sec between calls in all technologies.

Voice Tests: The drive test covered drive route of approximately 659 KMs over a period of 4 days from 7th to 10th Aug-17. Approximately 900 calls were made for each of the 16 networks: eight 2G networks, six 3G networks, one CDMA and one VoLTE network covering 9 unique TSPs.

* In case of multiple call failure in similar geo location in given period of 60sec has been counted as one call failure

Data Tests: Data Tests were performed at static locations for 1 day on 11th Aug; eight 2G (Lock mode) networks, six 3G (Dual mode) networks, one CDMA and four 4G (Free mode) networks covering 9 unique TSPs were tested.

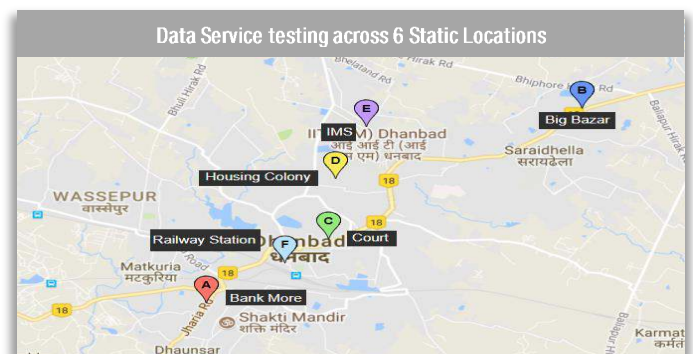
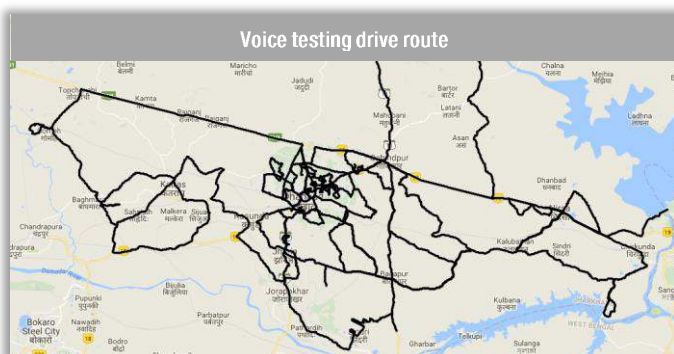
*Outlier values are discarded to calculate the below KPI's.

*For Voice and Data KPI's, 2G measurement is done with UE locked on 2G, 3G measurement is done with UE in Dual mode (2G & 3G) and 4G measurement is done with UE in Free Mode.

* 3G KPI's which is calculated from UE in Dual Mode (2G & 3G) includes samples and events of 2G.

* 4G KPI's which is calculated from the UE in Free Mode included samples and events of 2G & 3G.

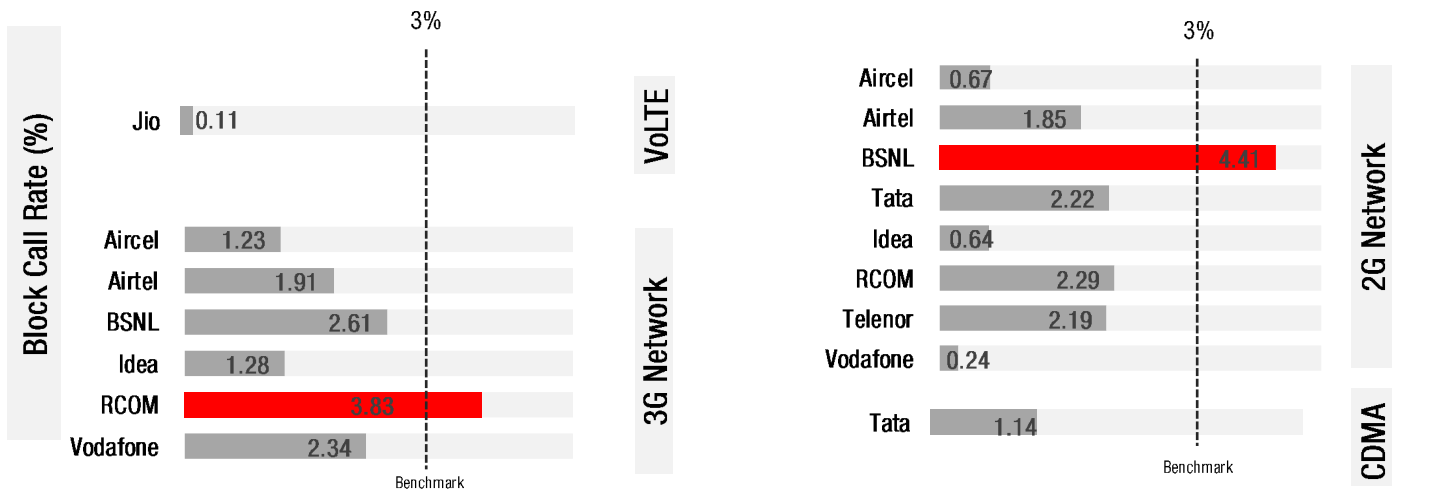
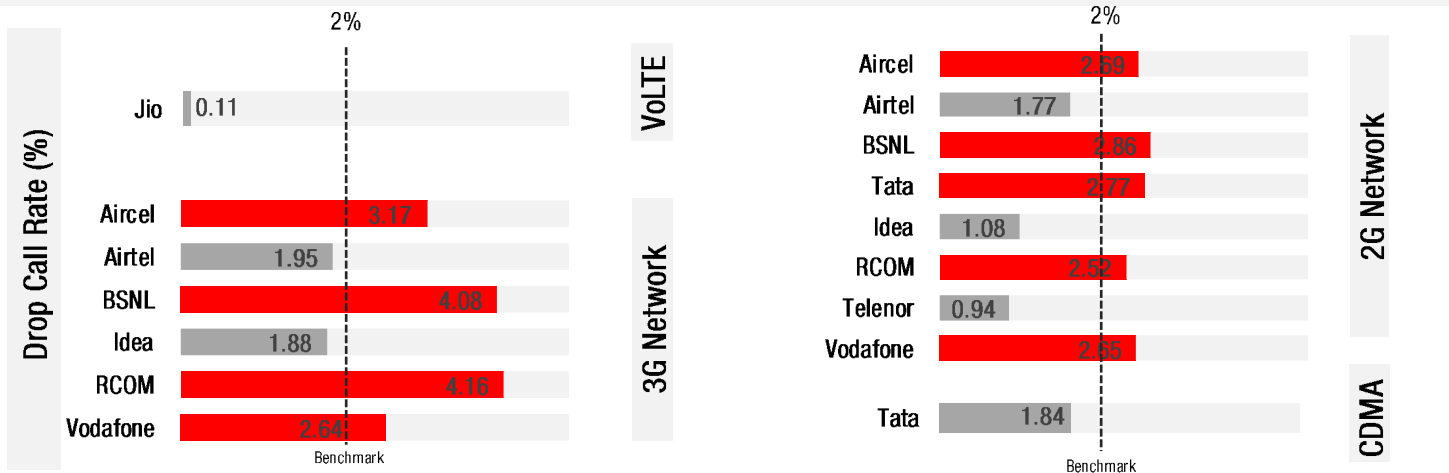
Service	Specifications
Download	2G (Locked) - 500KB, 3G (Dual) - 20 MB, 4G (Free) - 40 MB
Upload	2G (Locked) - 100KB, 3G (Dual) - 5 MB, 4G (Free) - 10 MB
Web Browsing	3 links of e/m commerce website www.amazon.in and www.flipkart.com, PayTm
Video Streaming	120 sec clip
Latency	32 Bytes on www.google.com



Voice Calls

Key Observations

QoS compliance of the TSPs in Dhanbad for Voice across technologies 2G/3G/4G-VoLTE is given below:



KPI	2G Networks							
	Aircel	Airtel	BSNL	Tata	Idea	RCOM	Telenor	Vodafone
SDCCH Congestion%	0.27%	0.98%	0.95%	1.60%	0.21%	0.53%	0.23%	0.24%
TCH Congestion %	0.40%	0.87%	3.47%	0.62%	0.43%	1.76%	1.96%	0.00%

KPI	3G						
	Aircel	Airtel	BSNL	Idea	RCOM	Vodafone	
SDCCH Congestion%	0.00%	0.00%	0.62%	0.00%	0.17%	0.00%	
RRC Congestion%	0.00%	1.80%	0.74%	0.12%	2.26%	2.09%	
SDCCH & RRC Congestion%	0.00%	1.80%	1.36%	0.12%	2.43%	2.09%	
TCH Congestion %	0.54%	0.11%	1.26%	1.05%	1.25%	0.00%	
RAB Congestion %	1.23%	0.00%	0.00%	0.12%	0.18%	0.25%	
TCH & RAB Congestion %	1.77%	0.11%	1.26%	1.16%	1.43%	0.25%	

- a) Most of the TSPs have failed to meet the 2% QoS benchmark of Drop Call Rate (DCR%).
- b) Call Block Rate (CBR%) benchmark of 3% was achieved by all TSP except RCOM 3G & BSNL 2G
- c) Airtel 3G, BSNL 3G, RCOM 3G and Vodafone 3G have failed to meet the SDCCH & RRC congestion benchmark .

Not meeting benchmark

Voice Calls

Key Observations

Coverage

a) Percentage of coverage samples for 2G \geq -85 dBm and CDMA \geq -90 dBm.

TSPs	2G								CDMA
	Aircel	Airtel	BSNL	Tata	Idea	RCOM	Telenor	Vodafone	Tata
Coverage%	51.8%	73.0%	61.2%	72.9%	75.1%	46.8%	62.6%	70.6%	63.44%

b) Percentage of coverage samples for 2G \geq -85 dBm, 3G \geq -90 dBm & LTE \geq -110 dBm

TSPs	3G						VoLTE
	Aircel	Airtel	BSNL	Idea	RCOM	Vodafone	Jio
Coverage %	51.15%	69.05%	60.32%	70.94%	45.82%	60.81%	91.77%

c) Percentage of time spent on 3G network:

TSPs	3G					
	Aircel*	Airtel	BSNL*	Idea	RCOM	Vodafone
Time Spent on 3G %	38.59%	65.52%	12.66%	31.97%	43.30%	87.16%

**BSNL & Aircel are moving the calls initiated on 3G to 2G network*

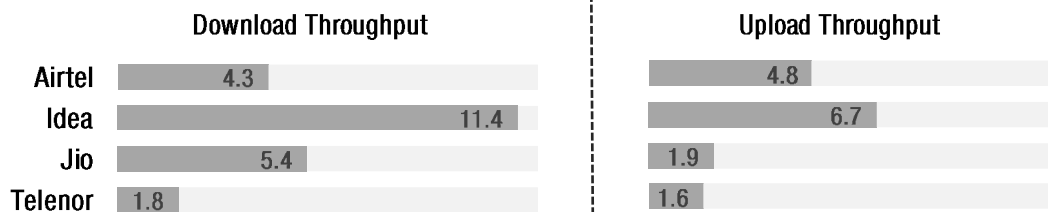
Data Services

Key Observations

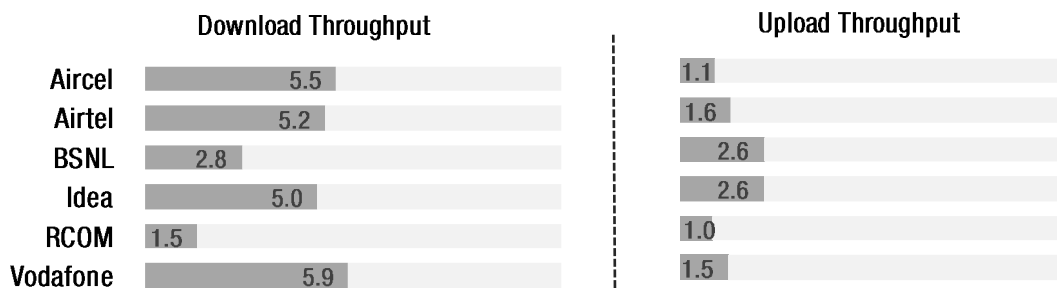
Data was tested at 6 locations viz. IMS, Big Bazar, Housing Colony, Court, Railway Station & Bank More. Following services were tested: Data Download/Upload, Latency (www.google.com), Video Streaming (YouTube) and Web browsing (Flipkart, Amazon, PayTm)

Data Download and Upload Performance (Mbps)

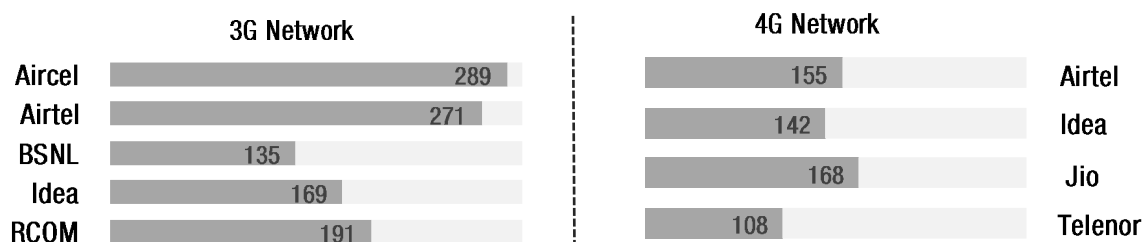
4G Network:



3G Network:



Latency (msec)



Data Services

Key Observations

Video Streaming Performance (120 sec YouTube video sample sizes)

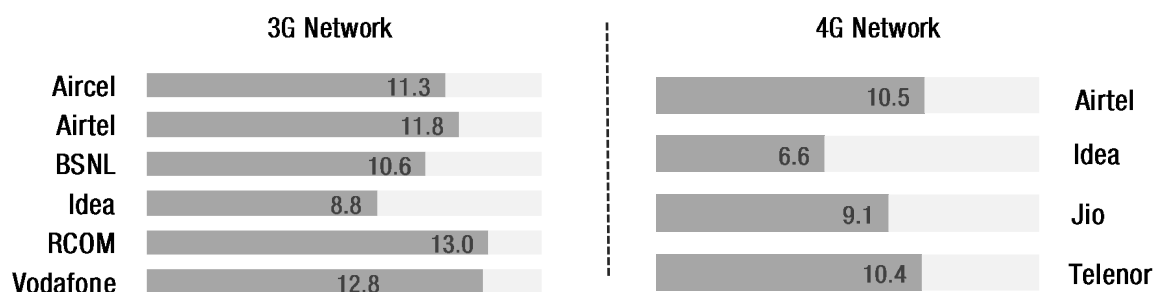


Streaming Delay further broken into 2 parameters which form the end-user perception to assess consistency on Video streaming.

- Initial Start time
- Interruption time while playing the video.

Video Streaming	3G						4G			
	Aircel	Airtel	BSNL	Idea	RCOM	Vodafone	Airtel	Idea	Jio	RCOM
Avg. Initial Start Time (sec)	4.5	3.0	4.4	1.8	3.7	2.3	3.0	1.5	2.3	2.8
Avg. Interruption Time (sec)	-	2.2	1.1	-	-	-	0.7	-	-	-

Web Page Download Time (sec)



Web browsing experience is the average time taken to fully load the websites tested.

Summary

City Level Summary

Voice Call	2G								CDMA
	Aircel	Airtel	BSNL	Tata	Idea	RCOM	Telenor	Vodafone	Tata
Call Attempt*	748	921	952	812	933	568	867	831	880
Blocked Call Rate (%)	0.67%	1.85%	4.41%	2.22%	0.64%	2.29%	2.19%	0.24%	1.14%
CSSR% (Accessibility)	99.33%	98.15%	95.59%	97.78%	99.36%	97.71%	97.81%	99.76%	98.86%
Dropped Call Rate (%)	2.69%	1.77%	2.86%	2.77%	1.08%	2.52%	0.94%	2.65%	1.84%
Mobility HOSR(%)	98.70%	96.00%	94.20%	99.00%	99.60%	99.70%	98.20%	99.60%	100.00%
Rx Quality	96.90%	95.08%	95.85%	96.17%	98.16%	93.44%	96.65%	96.75%	88.5%

Voice Call	3G						VoLTE
	Aircel	Airtel	BSNL	Idea	RCOM	Vodafone	Jio
Call Attempt*	734	942	806	861	575	813	930
Blocked Call Rate (%)	1.23%	1.91%	2.61%	1.28%	3.83%	2.34%	0.11%
CSSR% (Accessibility)	98.77%	98.09%	97.39%	98.72%	96.17%	97.66%	99.89%
Dropped Call Rate (%)	3.17%	1.95%	4.08%	1.88%	4.16%	2.64%	0.11%
Mobility HOSR(%)	99.10%	99.10%	88.80%	99.80%	99.90%	100.00%	99.80%
Rx Quality	94.01%	92.89%	94.10%	96.70%	88.41%	87.53%	73.54%

* In most of the TSPs, calls did not initiate at the outskirts of Dhanbad city due to lack of coverage

Summary

City Level Summary

Data Services	Aircel 2G	Airtel 2G	BSNL 2G	Tata 2G	Idea 2G	RCOM 2G	Telenor 2G	Vodafone 2G*	Tata CDMA
Download Throughput (Kbps)	117.9	109.1	137.4	81.2	168.2	106.1	92.3	82.7	640.2
Upload Throughput (Kbps)	49.2	52.3	45.3	38.0	75.7	67.9	37.0	42.5	270.0
Web Browsing Delay (sec)	28.2	28.6	28.2	24.7	29.9	25.7	26.6	28.7	27.8
Latency (msec)	252	320	219	283	369	276	372	-	203

Data Services	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	RCOM 3G	Vodafone 3G*	Airtel 4G	Idea 4G	Jio 4G	Telenor 4G
Download Throughput (Mbps)	5.5	5.2	2.8	5.0	1.5	5.9	4.3	11.4	5.4	1.8
Upload Throughput (Mbps)	1.1	1.6	2.6	2.6	1.0	1.5	4.8	6.7	1.9	1.6
Web Browsing Delay (sec)	11.3	11.8	10.6	8.8	13.0	12.8	10.5	6.6	9.1	10.4
Video Streaming Delay (sec)	4.5	5.2	5.5	1.8	3.7	2.3	3.7	1.5	2.3	2.8
Latency (msec)	289	271	135	169	191	-	155	142	168	108

* Vodafone has disabled ping in there network

Summary

City Level Summary

Bank More	2G								CDMA	3G						4G			
	Aircel	Airtel	BSNL	Tata	Idea	RCOM	Telenor	Vodafone	Tata	Aircel	Airtel	BSNL	Idea	RCOM	Vodafone	Airtel	Idea	Jio	Telenor
Download Throughput (3G/4G :Mbps, 2G : Kbps)	161.6	115.7	176.1	85.6	193.0	100.5	95.9	68.8	1067.0	8.5	4.7	5.2	6.3	4.9	5.7	3.7	6.3	5.4	3.7
Upload Throughput (3G/4G :Mbps, 2G : Kbps)	51.2	57.5	47.7	45.1	88.0	66.4	35.3	50.7	326.4	1.4	1.0	3.0	3.0	1.9	1.2	5.7	7.1	2.2	1.7
Web Browsing Delay (sec)	30.9	30.2	29.8	24.7	25.6	26.3	23.9	25.0	15.0	7.6	10.2	8.9	8.4	8.1	12.5	9.5	6.8	7.8	7.7
Video Streaming Delay (sec)	-	-	-	-	-	-	-	-	-	5.3	2.0	3.0	1.7	1.4	3.7	1.9	1.4	1.9	0.9
Latency (msec)	205	324	241	276	393	237	243	-	153	263	320	113	150	121	-	132	139	152	86

Big Bazar	2G								CDMA	3G						4G			
	Aircel	Airtel	BSNL	Tata	Idea	RCOM	Telenor	Vodafone	Tata	Aircel	Airtel	BSNL	Idea	RCOM	Vodafone	Airtel	Idea	Jio	Telenor
Download Throughput (3G/4G :Mbps, 2G : Kbps)	93.6	84.7	101.0	151.9	165.8	110.3	-	79.3	850.1	1.5	7.4	0.4	5.6	0.8	7.4	3.1	13.3	2.6	1.2
Upload Throughput (3G/4G :Mbps, 2G : Kbps)	46.1	52.2	47.8	32.7	58.5	58.5	-	40.7	298.1	0.2	1.4	0.4	1.5	0.1	1.3	4.1	6.2	1.8	1.2
Web Browsing Delay (sec)	24.9	25.0	36.4	28.5	32.0	-	-	26.4	23.4	16.1	0.0	18.4	7.6	13.2	12.5	12.8	4.9	8.7	10.9
Video Streaming Delay (sec)	-	-	-	-	-	-	-	-	-	1.6	-	16.8	2.5	2.3	1.4	4.4	1.6	2.2	4.6
Latency (msec)	296	350	262	228	370	218	-	-	187	317	-	145	121	164	-	118	121	168	109

Court	2G								CDMA	3G						4G			
	Aircel	Airtel	BSNL	Tata	Idea	RCOM	Telenor	Vodafone	Tata	Aircel	Airtel	BSNL	Idea	RCOM	Vodafone	Airtel	Idea	Jio	Telenor
Download Throughput (3G/4G :Mbps, 2G : Kbps)	29.9	120.0	174.6	5.4	195.9	38.2	92.9	107.5	21.8	2.7	3.2	2.7	8.3	0.3	5.3	1.9	16.5	3.3	1.7
Upload Throughput (3G/4G :Mbps, 2G : Kbps)	-	54.4	52.2	31.5	94.4	32.1	45.8	47.2	29.8	0.9	3.2	2.8	4.3	-	2.0	1.3	6.7	1.2	1.8
Web Browsing Delay (sec)	21.7	27.4	23.5	18.7	29.6	21.0	29.9	28.8	33.5	10.6	11.9	8.5	7.8	17.9	12.3	13.0	6.7	9.3	-
Video Streaming Delay (sec)	-	-	-	-	-	-	-	-	-	21.4	5.1	3.2	1.5	4.2	1.9	13.2	1.2	2.7	-
Latency (msec)	309	289	211	291	350	261	255	-	281	314	227	104	196	442	-	144	138	144	-

Summary

City Level Summary

Housing Colony	2G								CDMA	3G						4G			
	Aircel	Airtel	BSNL	Tata	Idea	RCOM	Telenor	Vodafone	Tata	Aircel	Airtel	BSNL	Idea	RCOM	Vodafone	Airtel	Idea	Jio	Telenor
Download Throughput (3G/4G :Mbps, 2G : Kbps)	131.3	90.1	138.3	40.7	151.0	114.4	115.1	102.1	942.6	6.2	7.9	2.4	3.1	0.1	4.4	7.6	16.9	14.8	1.2
Upload Throughput (3G/4G :Mbps, 2G : Kbps)	52.3	52.3	42.6	42.0	73.0	67.6	41.1	42.4	340.6	1.4	1.5	2.9	2.2	0.6	1.6	6.3	8.0	4.1	1.7
Web Browsing Delay (sec)	30.5	28.6	28.1	22.0	30.5	26.3	29.2	30.8	20.2	11.2	11.4	8.5	9.2	-	16.8	12.2	5.9	6.9	11.1
Video Streaming Delay (sec)	-	-	-	-	-	-	-	-	-	1.0	2.2	3.0	1.7	-	0.9	3.6	-	2.0	3.7
Latency (msec)	247	319	242	256	325	340	320	-	155	296	316	107	145	-	-	142	-	150	115

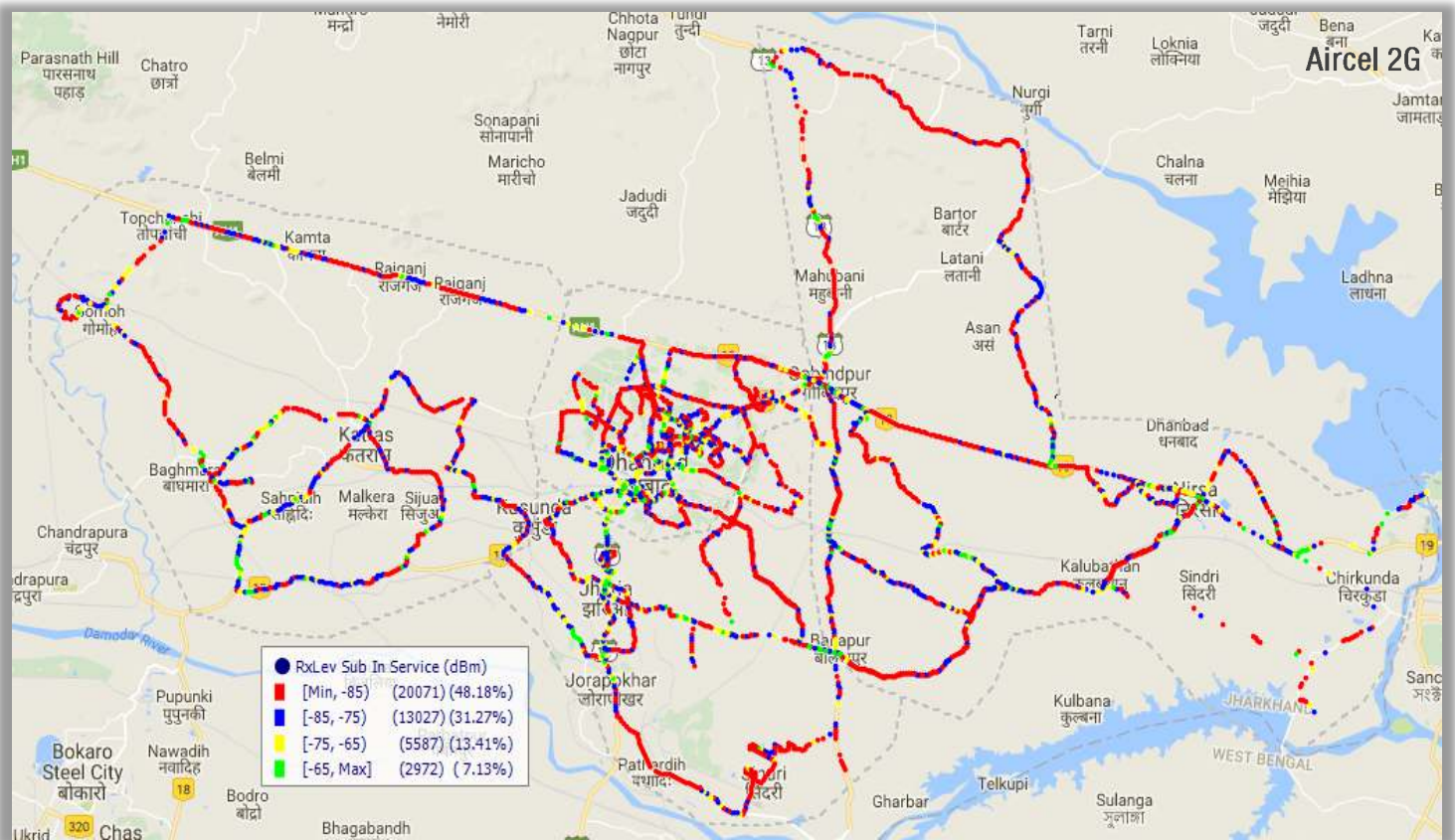
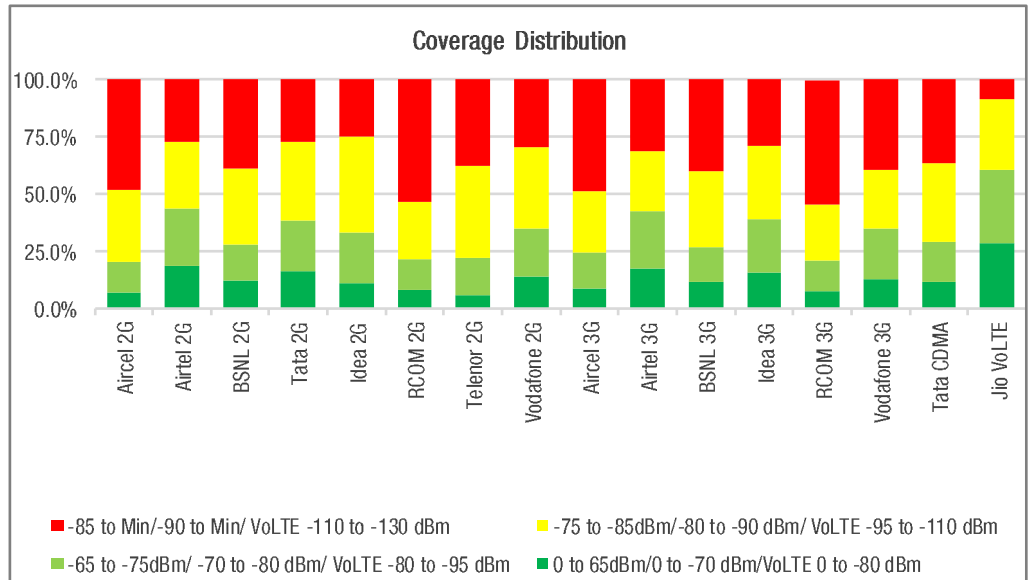
IMS	2G								CDMA	3G						4G			
	Aircel	Airtel	BSNL	Tata	Idea	RCOM	Telenor	Vodafone	Tata	Aircel	Airtel	BSNL	Idea	RCOM	Vodafone	Airtel	Idea	Jio	Telenor
Download Throughput (3G/4G :Mbps, 2G : Kbps)	156.2	108.4	65.2	45.2	159.4	138.4	68.2	71.5	323.5	7.4	4.0	1.5	3.7	0.4	5.3	4.3	6.1	4.6	1.4
Upload Throughput (3G/4G :Mbps, 2G : Kbps)	57.7	47.3	56.1	44.8	81.5	77.6	26.7	50.6	301.0	1.3	1.3	1.2	1.8	-	1.4	4.5	4.7	1.8	0.0
Web Browsing Delay (sec)	33.4	27.9	31.0	19.8	30.8	27.7	16.6	26.2	30.8	9.5	12.9	15.7	11.0	15.2	10.7	14.8	8.0	8.4	11.5
Video Streaming Delay (sec)	-	-	-	-	-	-	-	-	-	1.0	14.0	11.4	2.3	7.3	1.1	4.5	1.8	2.7	1.9
Latency (msec)	243	341	201	303	375	245	452	-	218	278	220	240	195	288	-	162	170	173	126

Railway Station	2G								CDMA	3G						4G			
	Aircel	Airtel	BSNL	Tata	Idea	RCOM	Telenor	Vodafone	Tata	Aircel	Airtel	BSNL	Idea	RCOM	Vodafone	Airtel	Idea	Jio	Telenor
Download Throughput (3G/4G :Mbps, 2G : Kbps)	158.8	129.5	151.3	121.9	144.0	128.7	77.7	71.9	15.8	6.7	4.0	4.6	3.0	1.2	6.7	5.3	9.5	0.1	1.5
Upload Throughput (3G/4G :Mbps, 2G : Kbps)	42.5	50.2	18.7	32.1	59.1	80.8	33.1	23.7	230.8	1.3	1.2	3.0	2.7	-	1.4	6.3	7.3	0.4	1.6
Web Browsing Delay (sec)	29.3	30.9	27.5	29.6	30.6	28.6	29.1	33.6	45.4	12.9	12.8	6.6	9.1	-	11.8	9.1	7.3	16.4	10.6
Video Streaming Delay (sec)	-	-	-	-	-	-	-	-	-	1.1	2.0	2.6	1.6	-	5.5	2.4	1.5		2.7
Latency (msec)	247	318	200	304	401	241	636	-	225	272	291	118	173	-	-	205	152	416	100

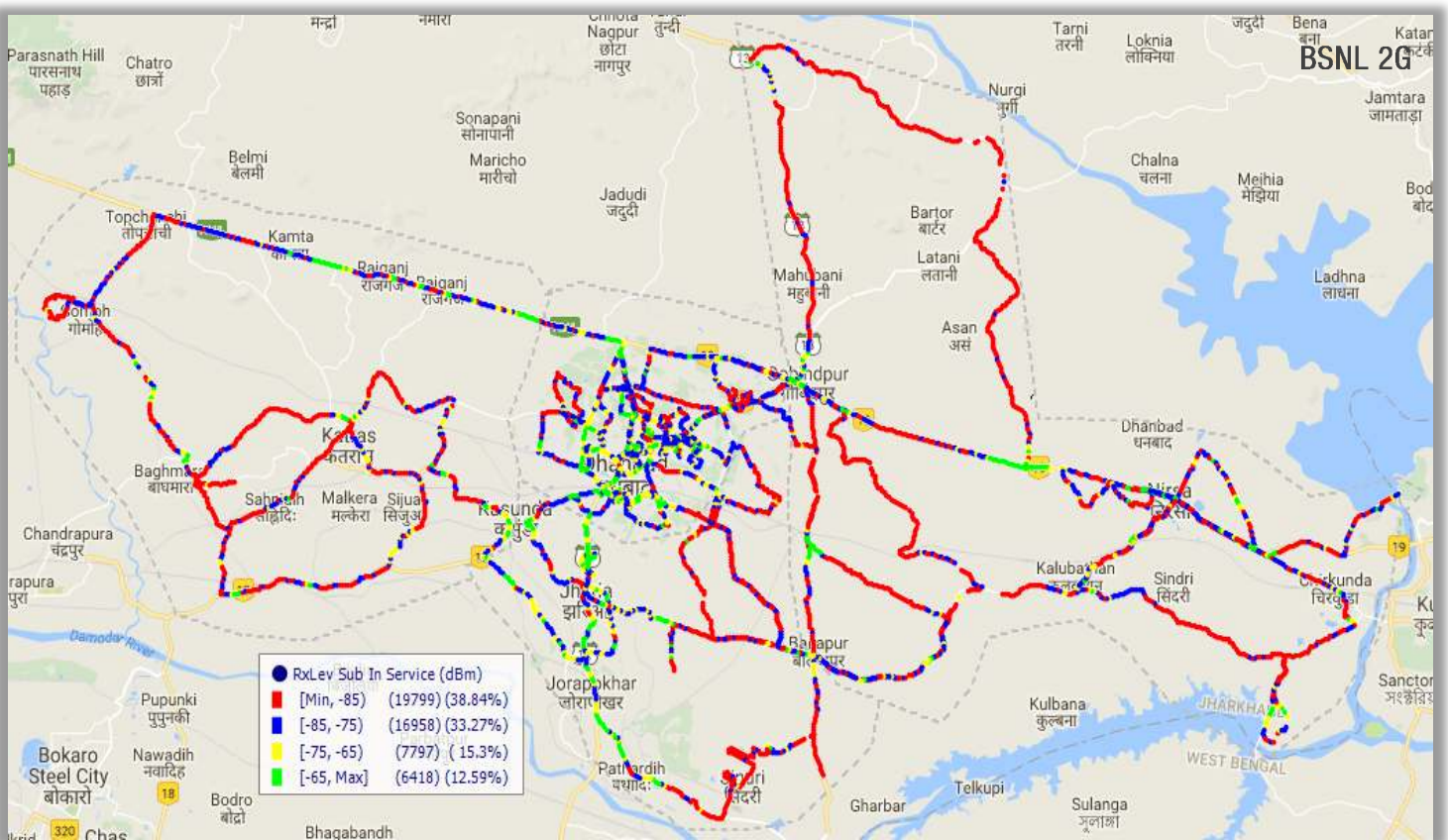
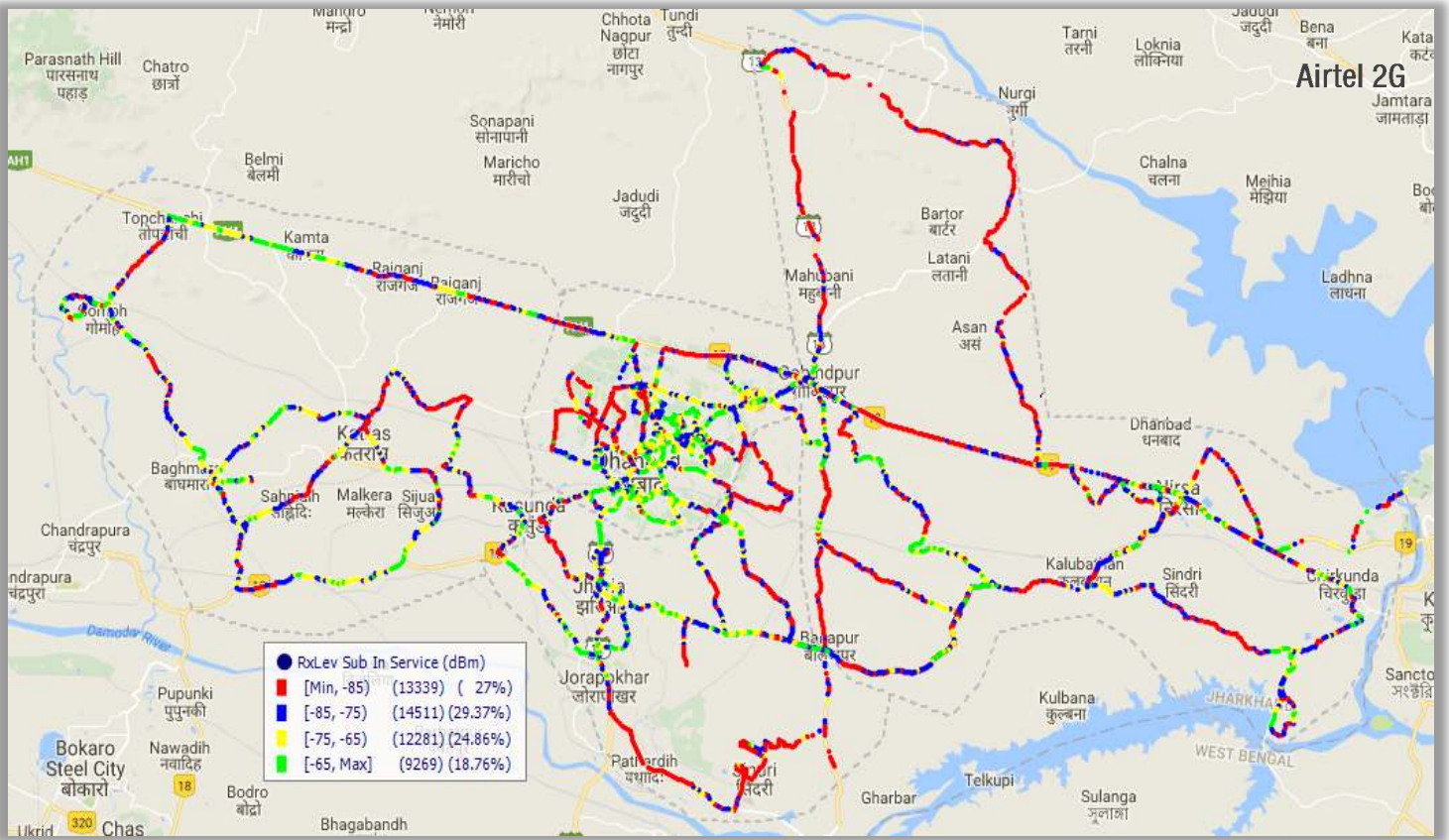
1. Coverage Details

RF Coverage relates to the geographical footprint within the system that has sufficient RF signal strength to provide for a call/data session. The Coverage rate of an TSP is calculated on the basis of % of samples in which the Rx level is ≥ -85 , RSCP is ≥ -90 dBm & RSRP ≥ -110 dBm. The details are as follows.

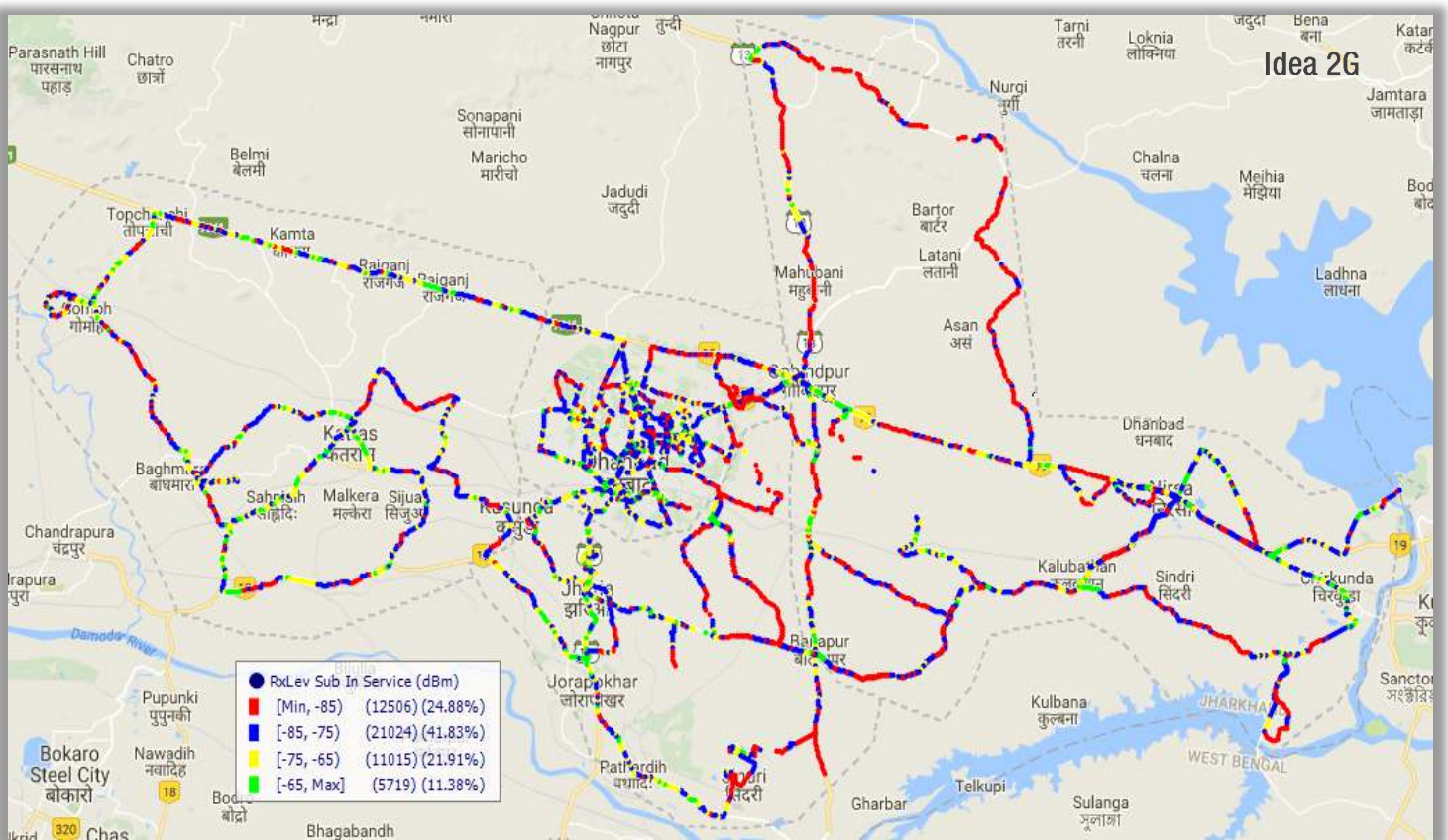
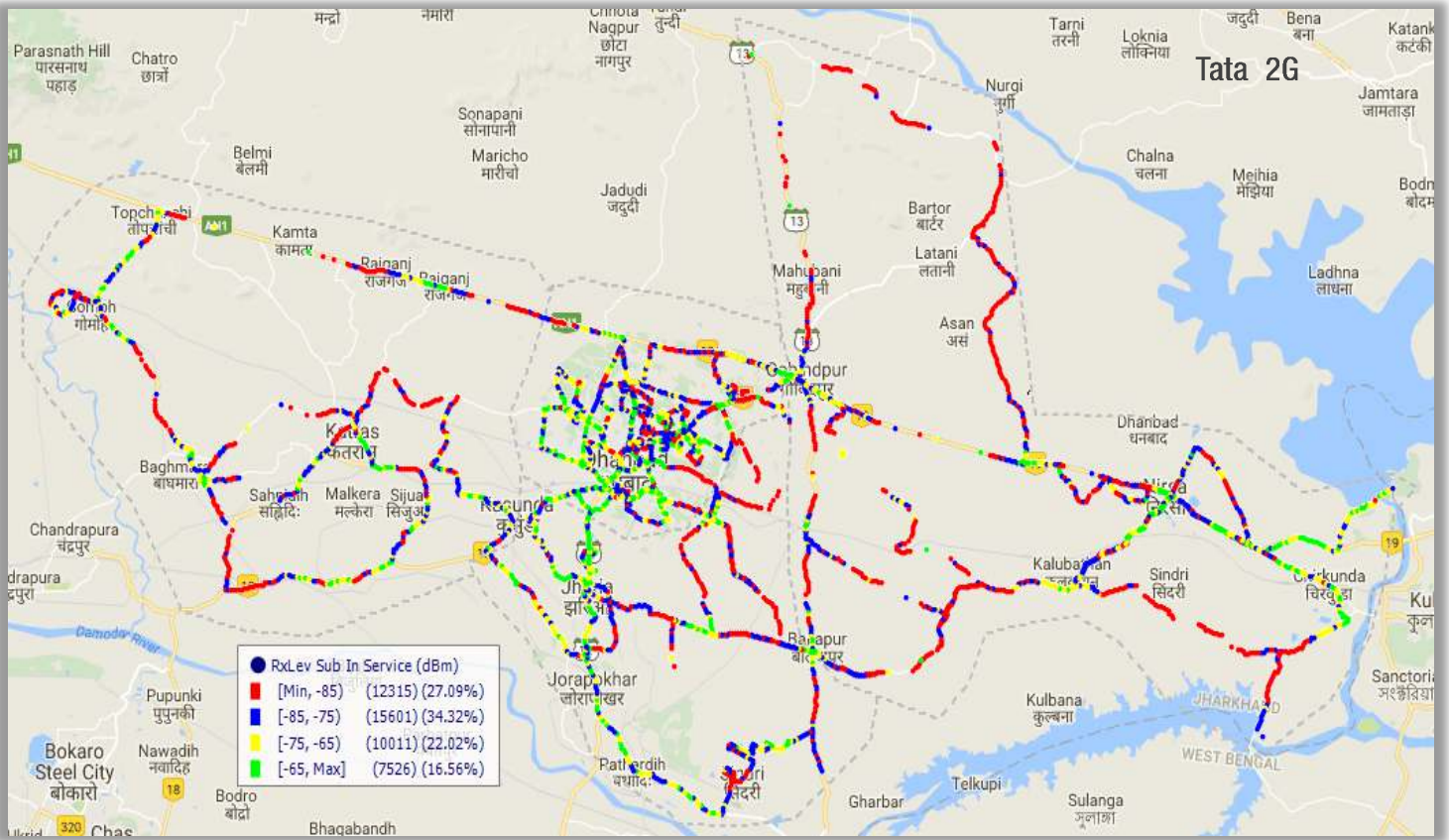
TSP	Coverage Rate
Aircel 2G	51.82%
Airtel 2G	73.00%
BSNL 2G	61.16%
Tata 2G	72.91%
Idea 2G	75.12%
RCOM 2G	46.84%
Telenor 2G	62.61%
Vodafone 2G	70.58%
Aircel 3G	51.15%
Airtel 3G	69.05%
BSNL 3G	60.32%
Idea 3G	70.94%
RCOM 3G	45.82%
Vodafone 3G	60.81%
Tata CDMA	63.44%
Jio VoLTE	91.77%



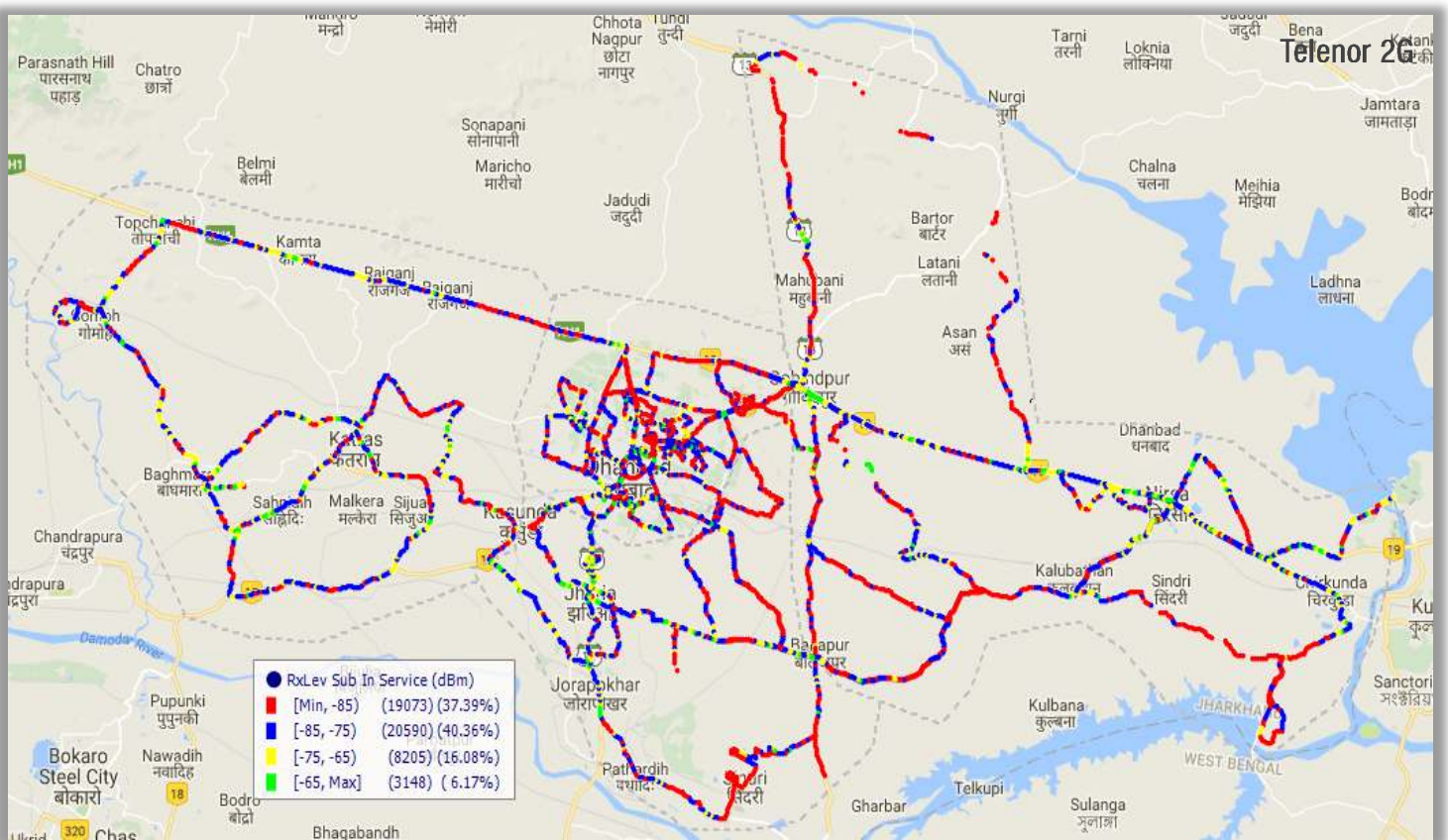
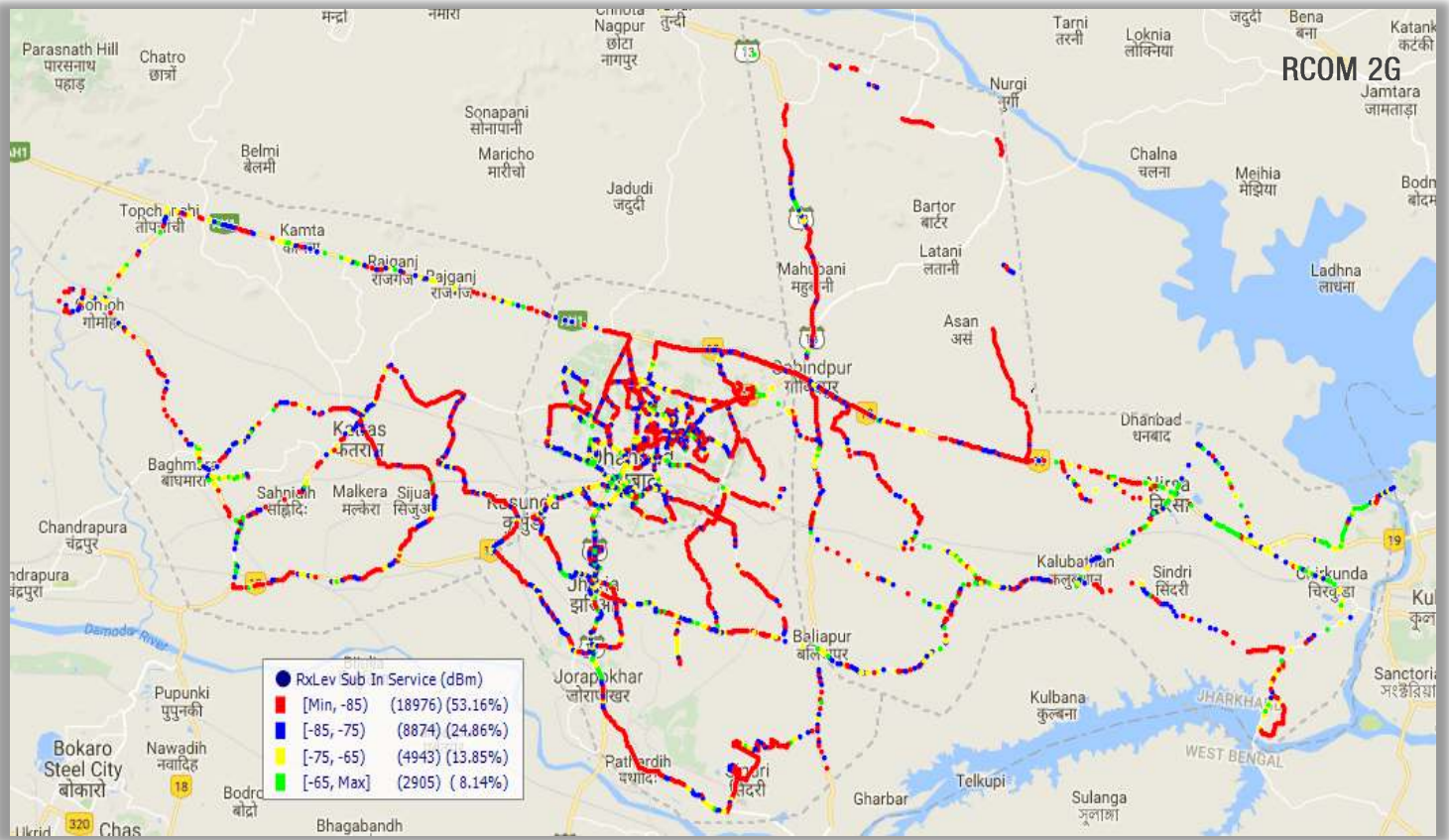
1. Coverage Details (contd.)



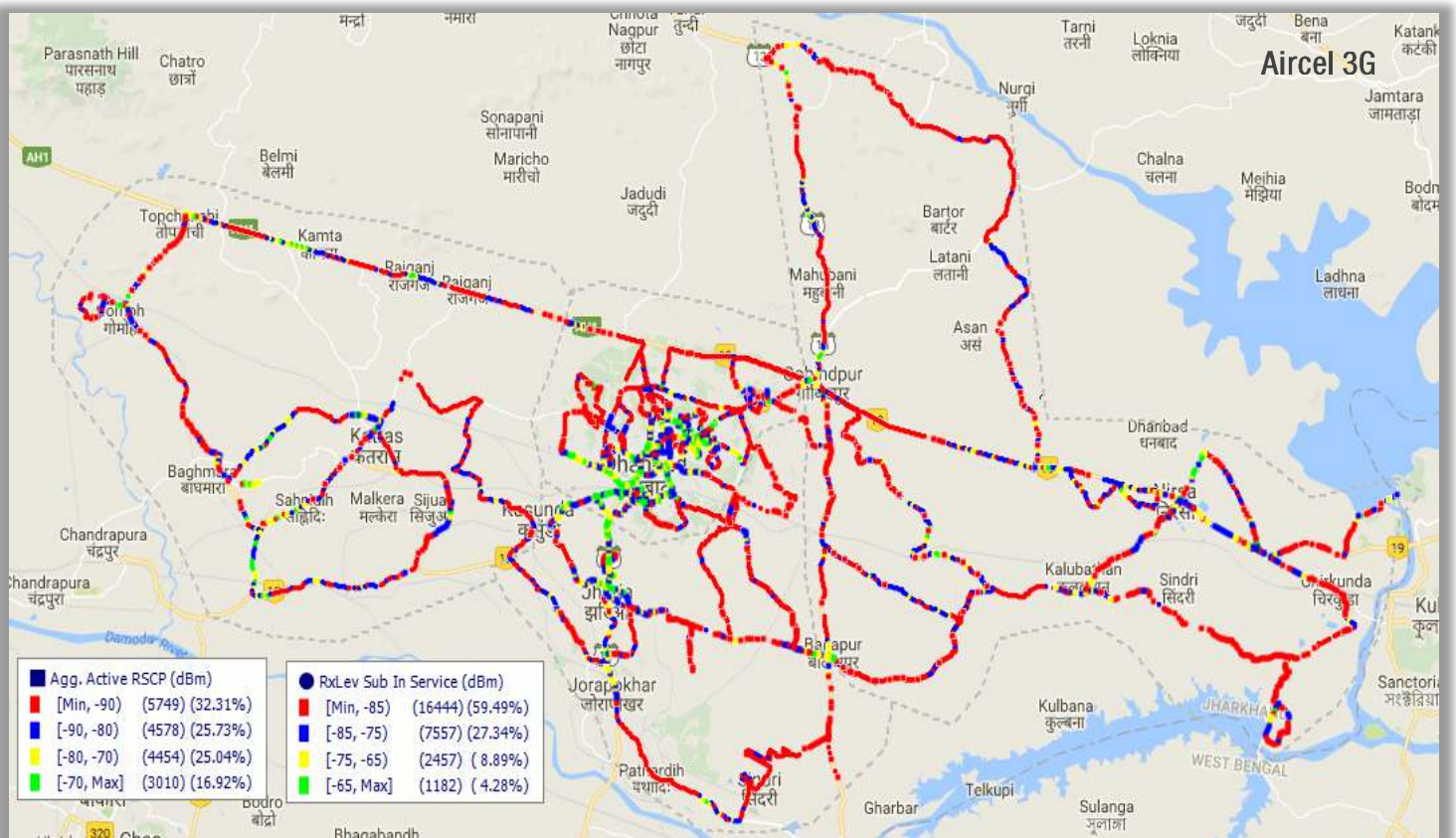
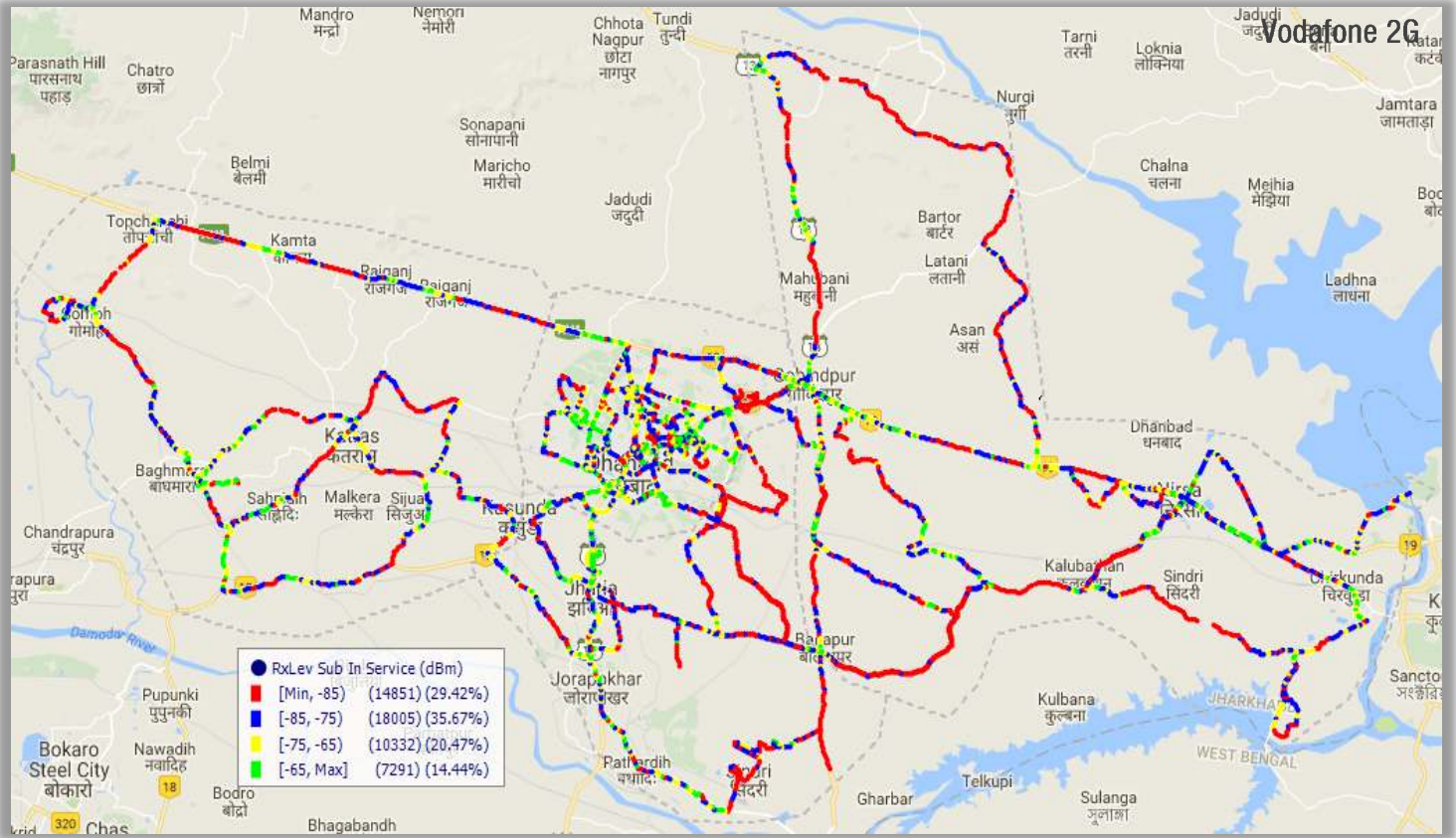
1. Coverage Details (contd.)



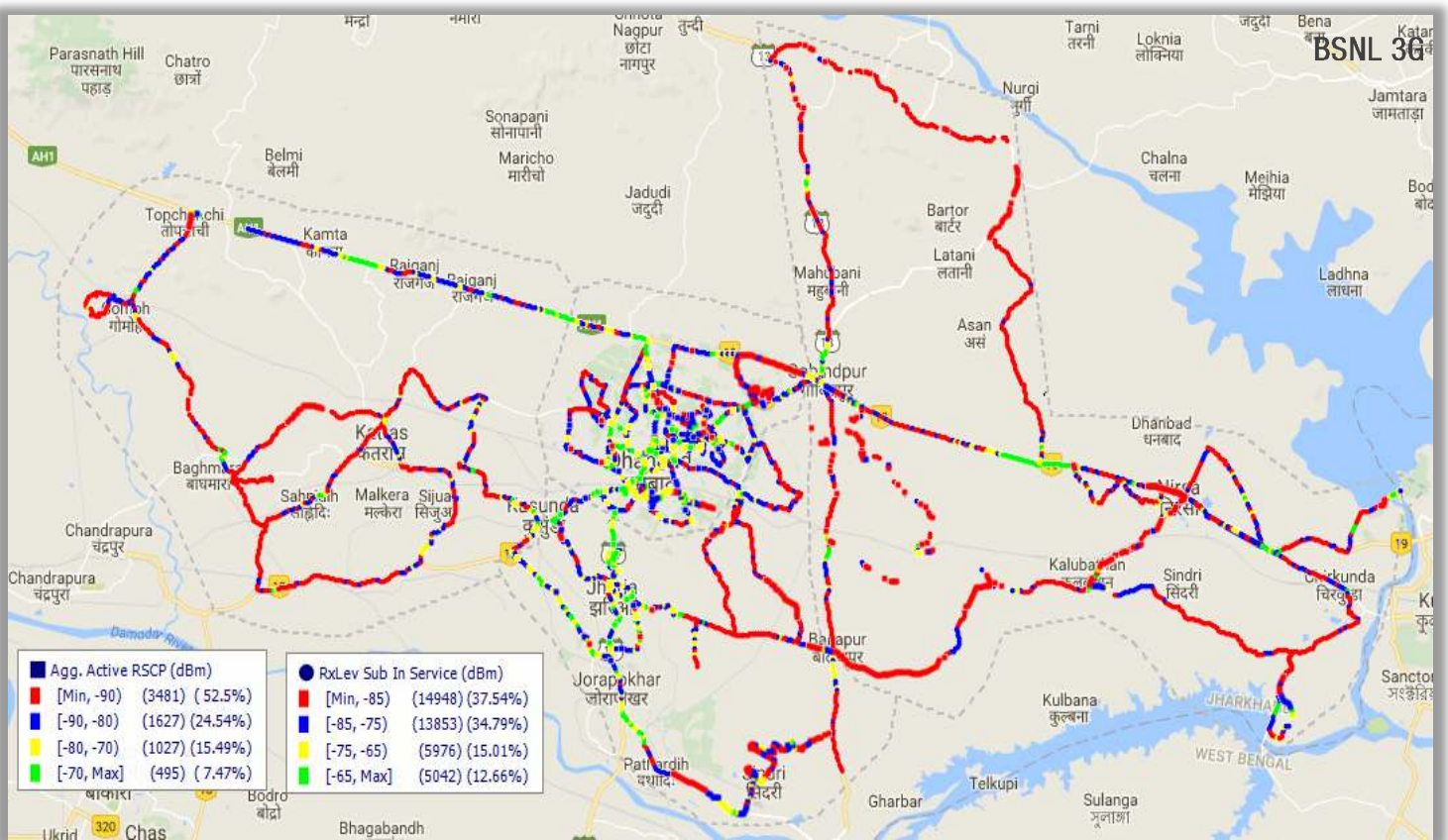
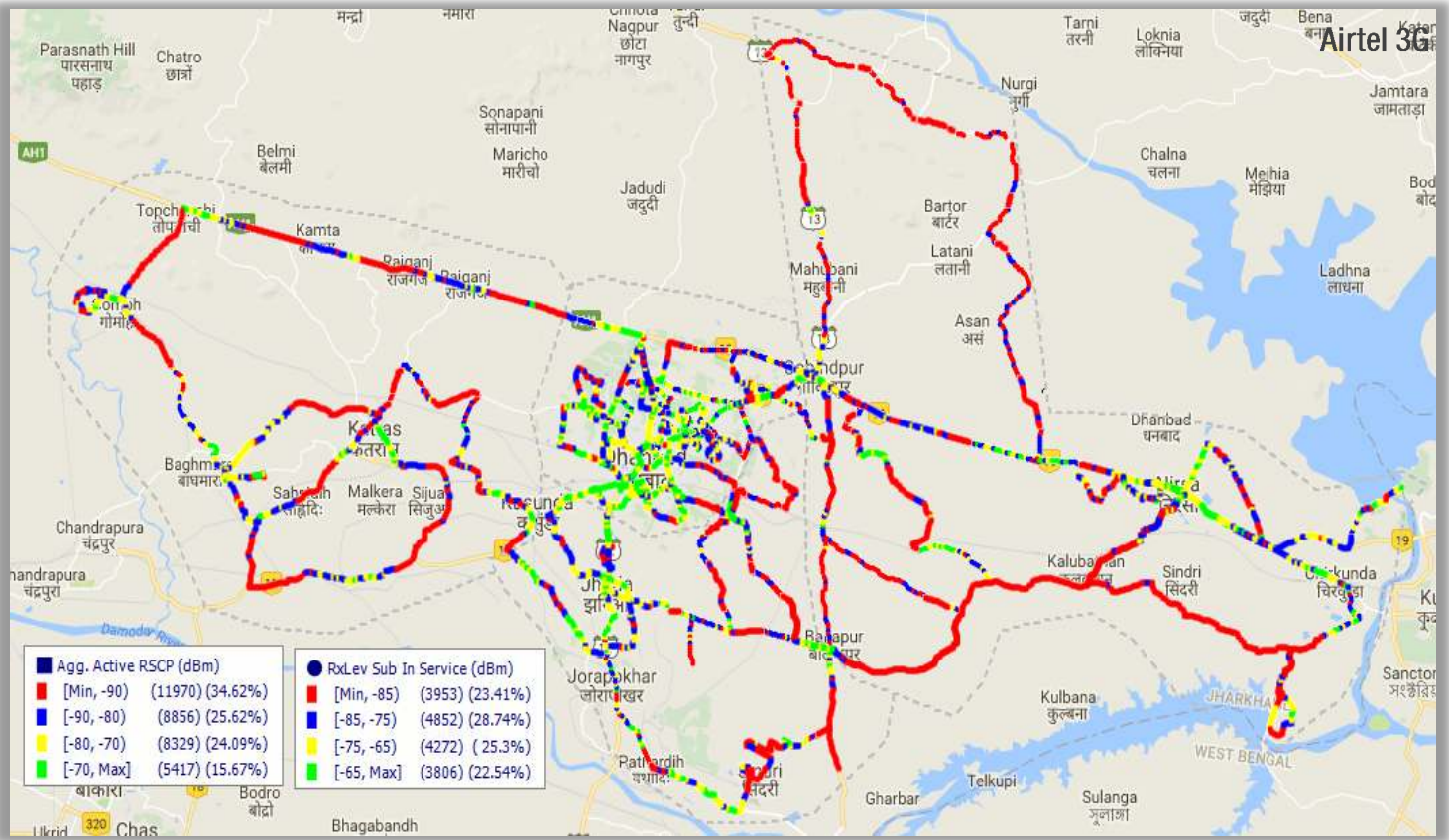
1. Coverage Details (contd.)



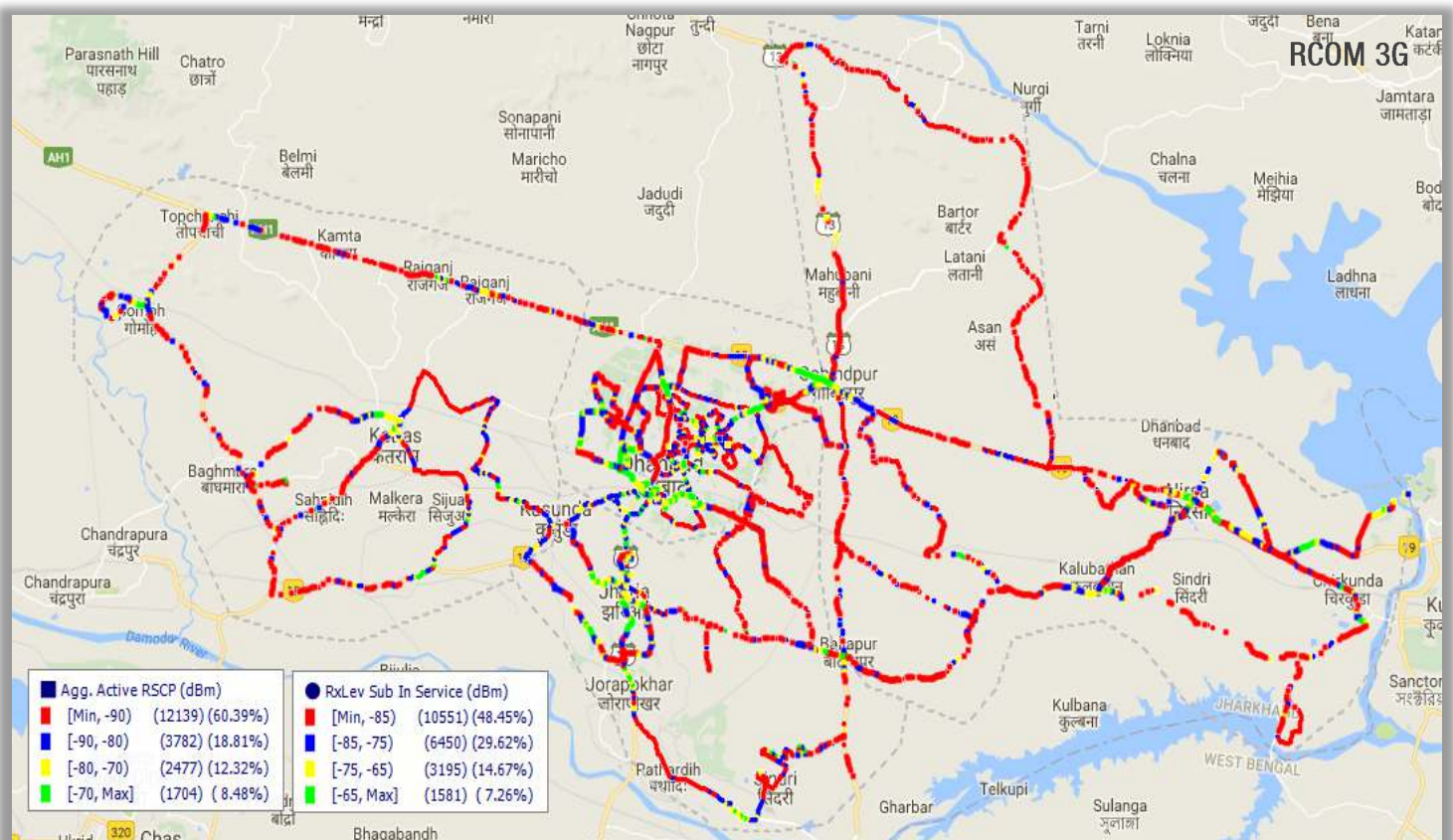
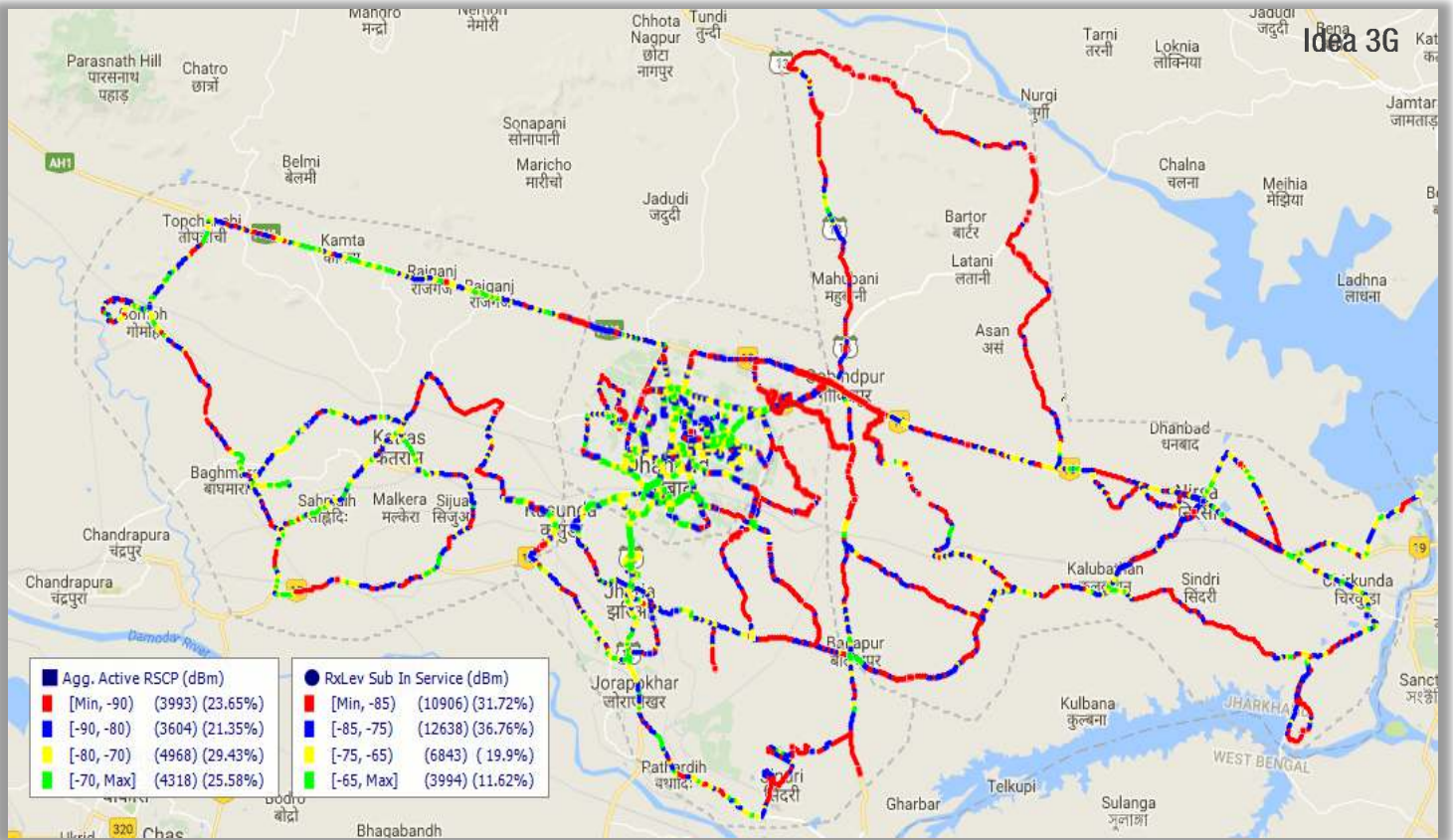
1. Coverage Details (contd.)



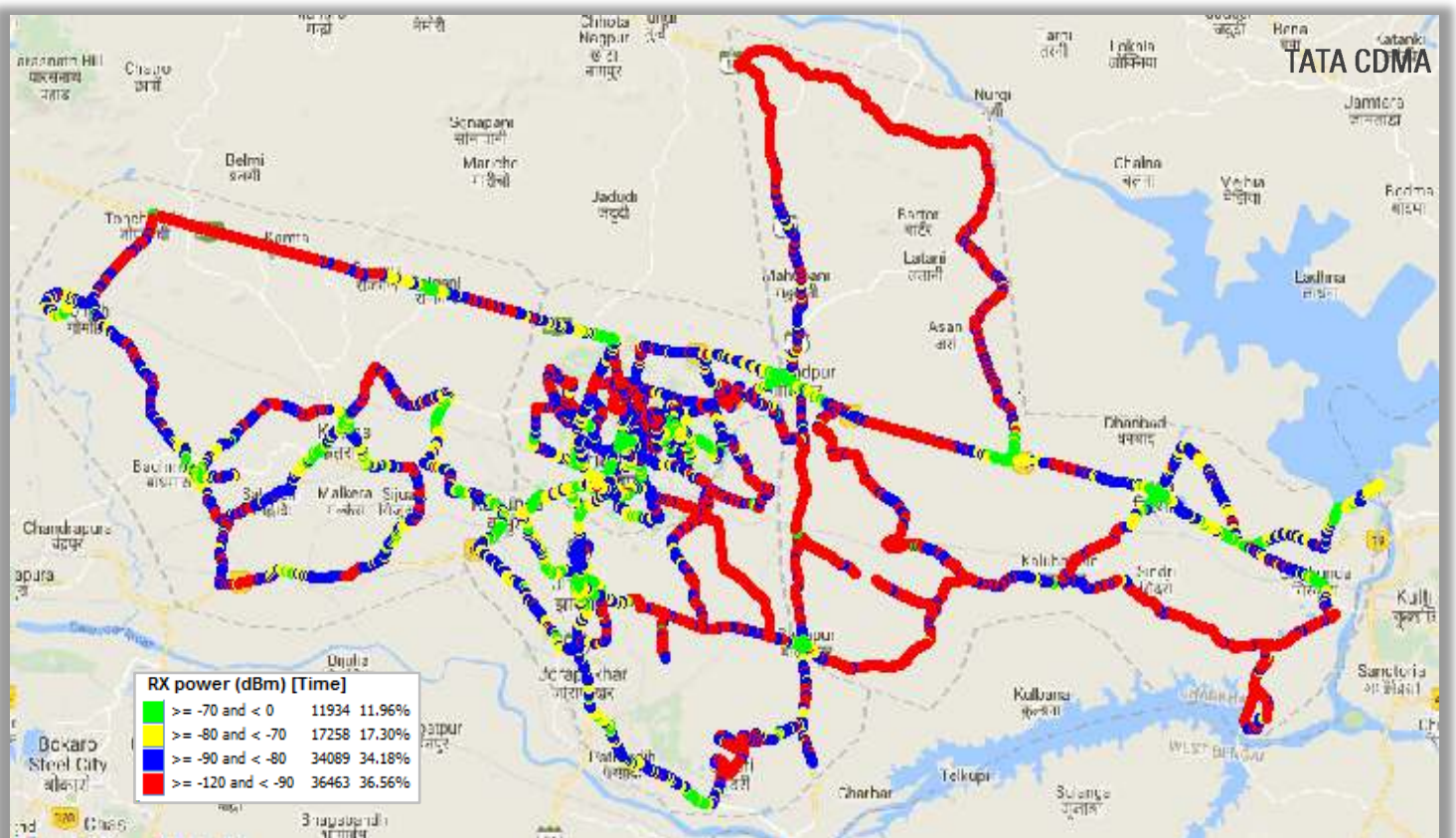
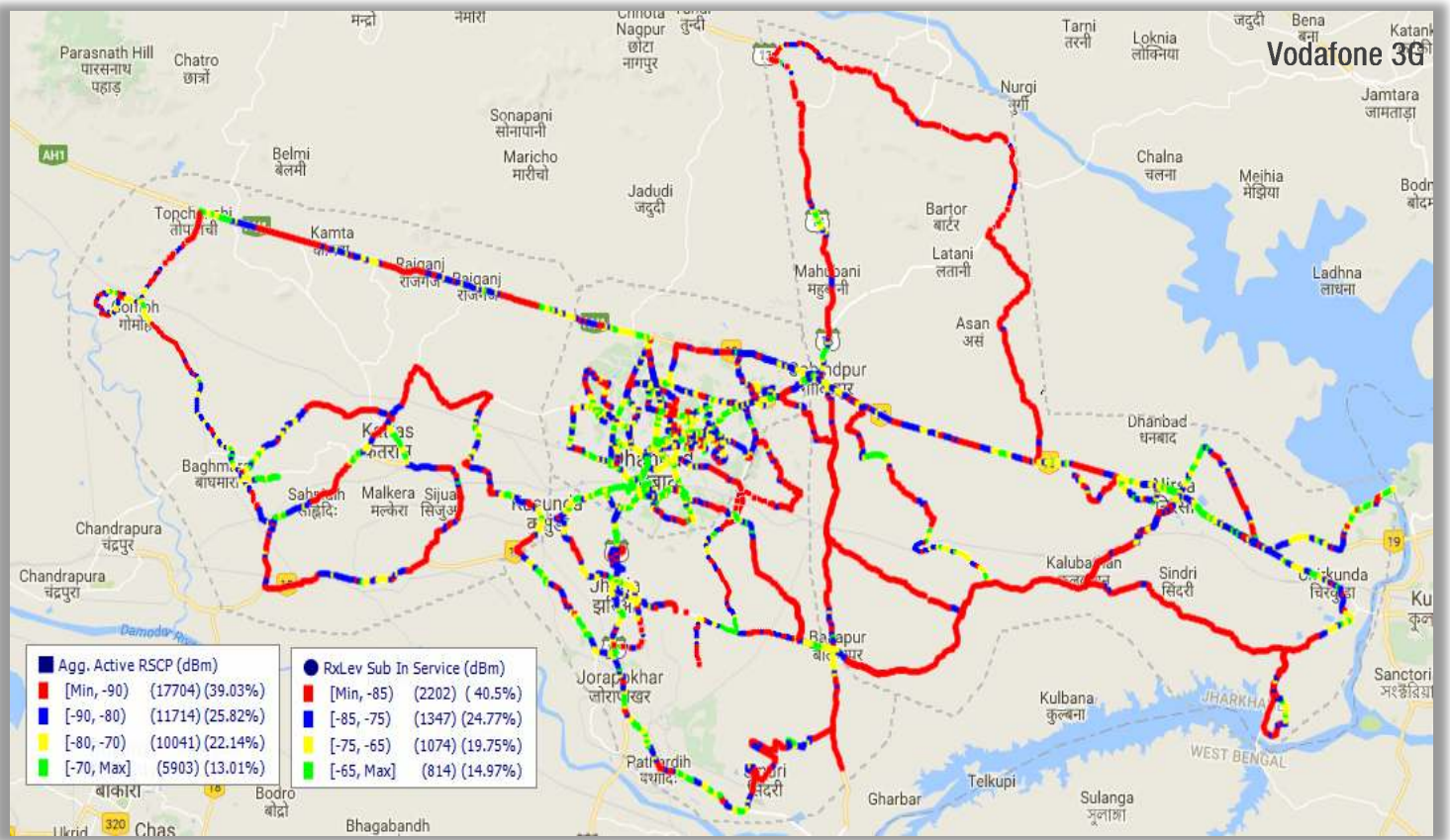
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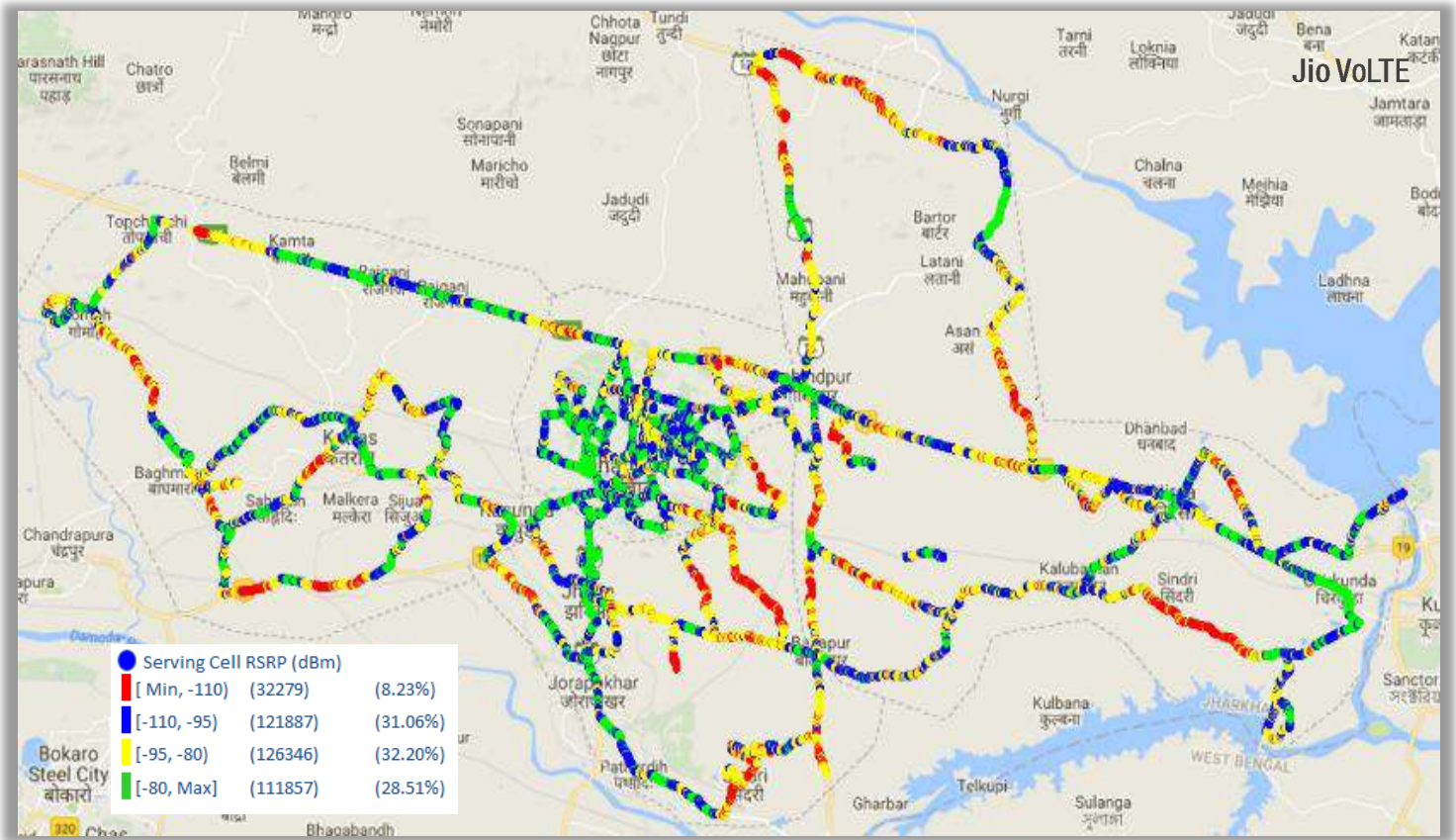
1. Coverage Details (contd.)



1. Coverage Details (contd.)



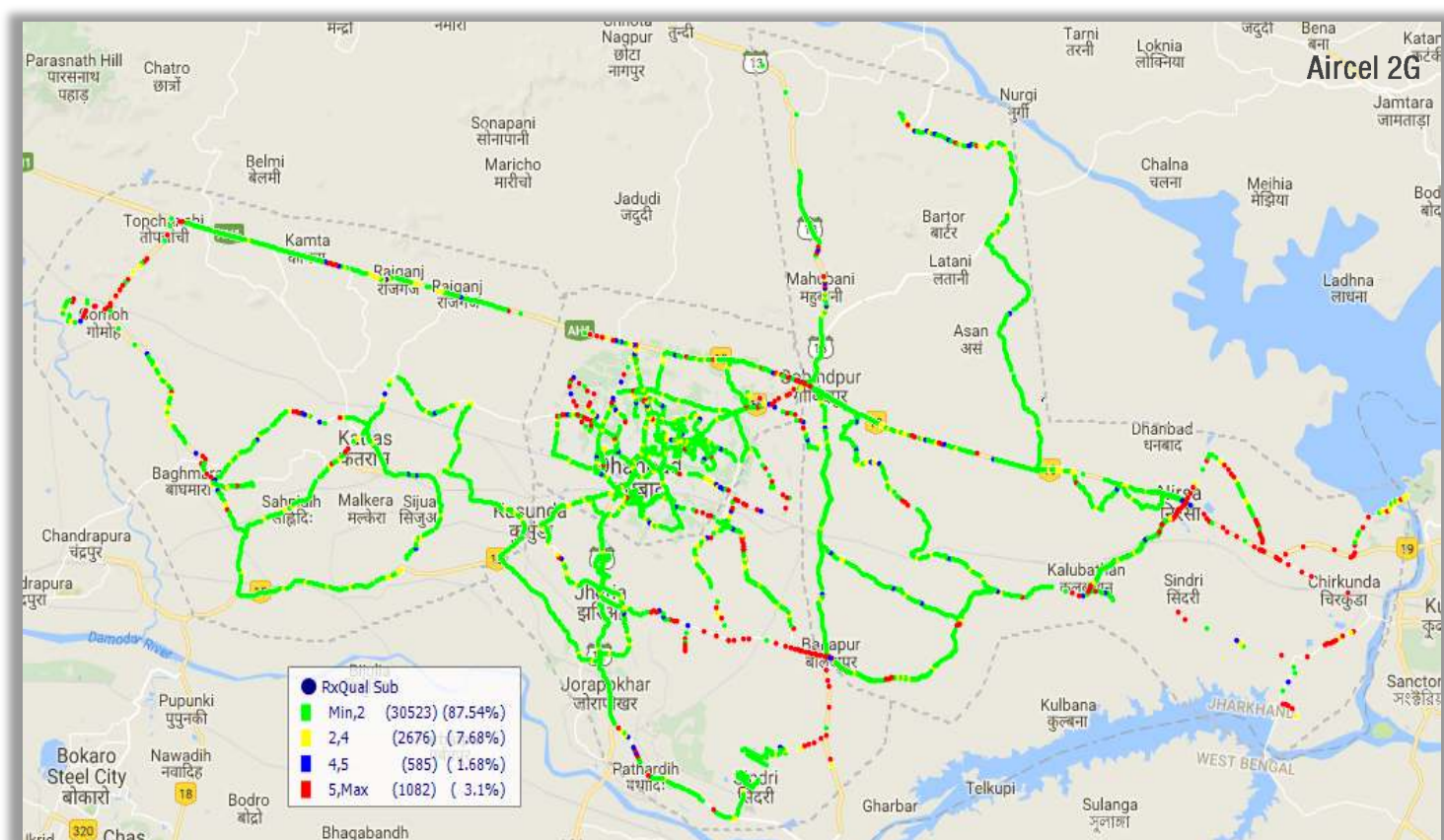
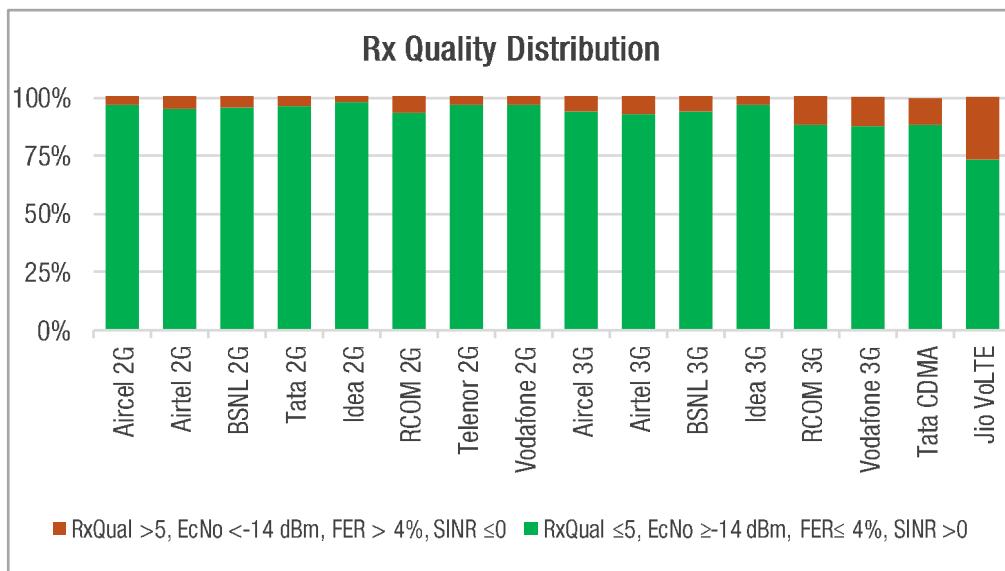
1. Coverage Details



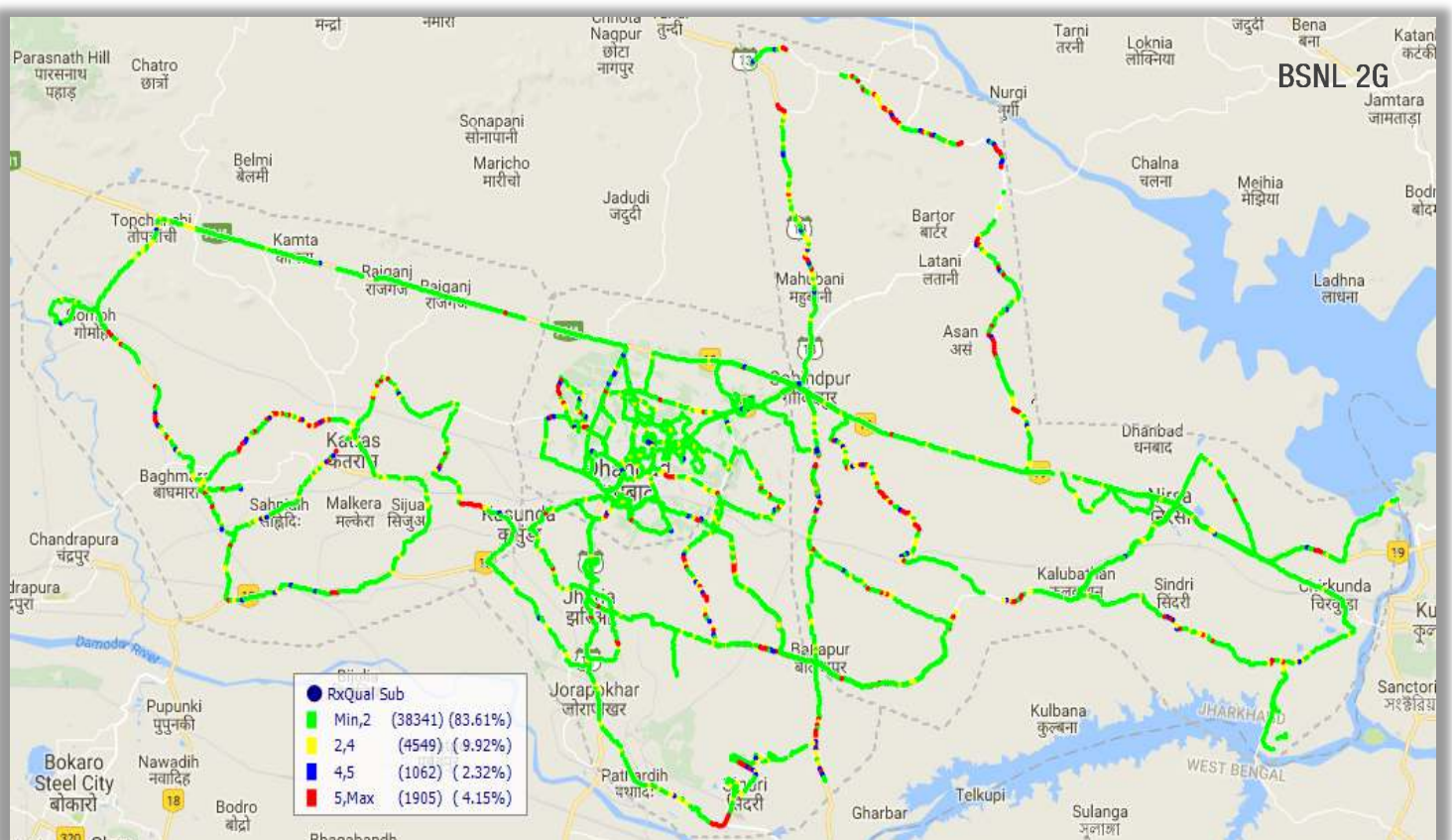
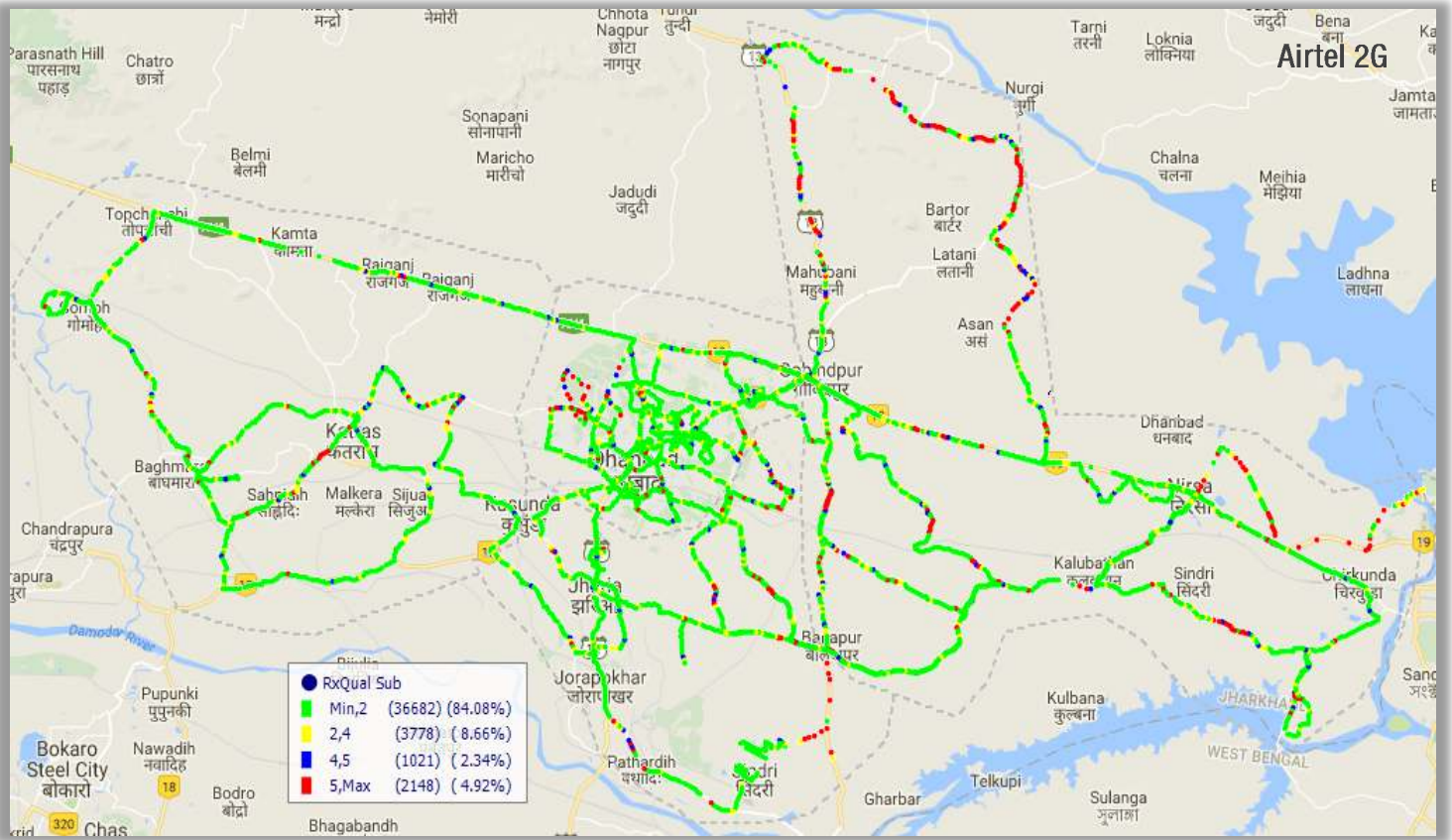
2. Quality Details

For measuring voice quality, as per the QoS norms, RxQual ≤ 5 for GSM TSPs, EcNo ≥ -14 dBm for 3G TSPs, FER $\leq 4\%$ for CDMA TSPs and SINR > 0 in case of VoLTE is considered to be good, where as quality beyond this benchmark is considered to be bad. The benchmark should usually be $\geq 95\%$.

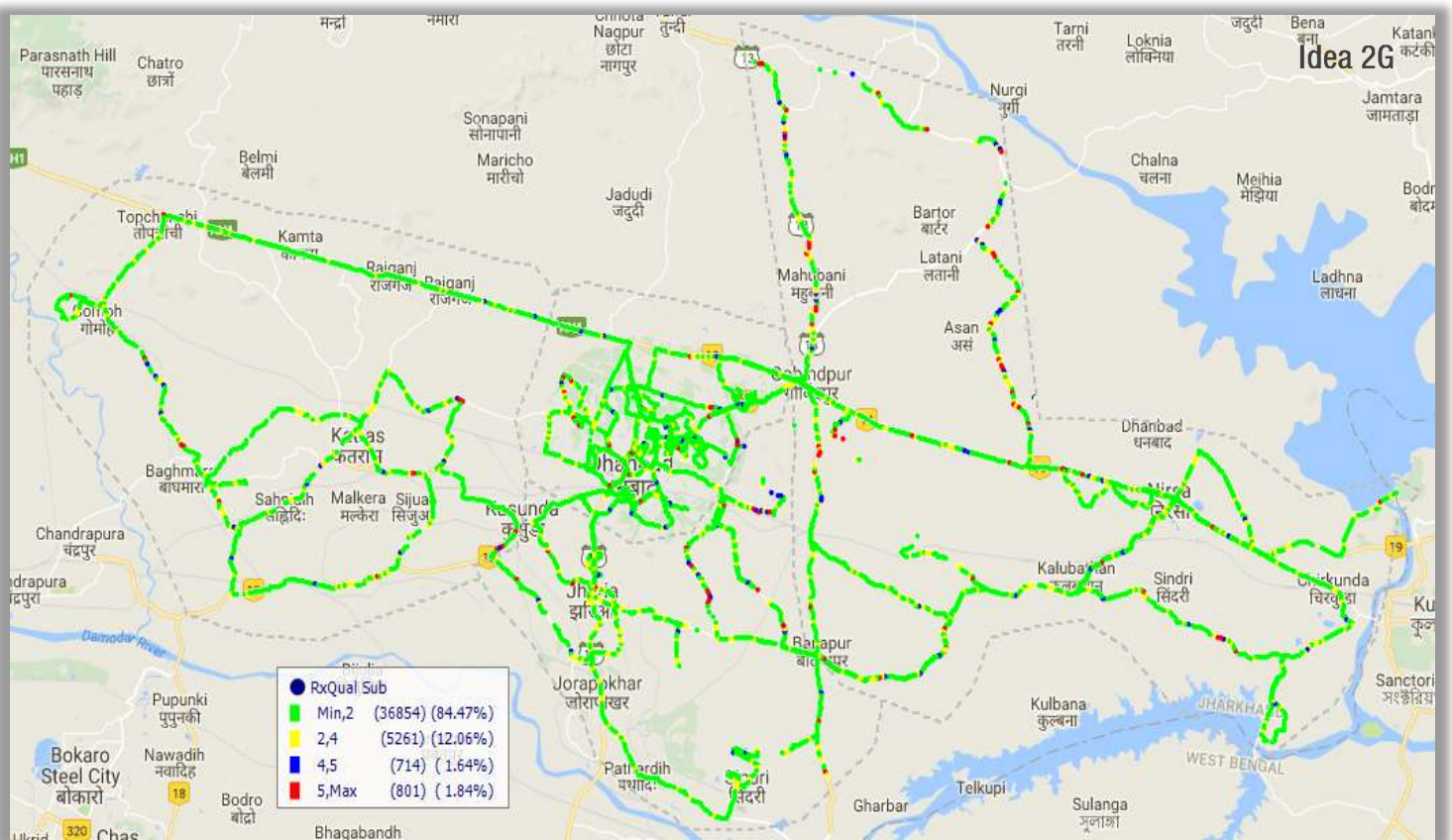
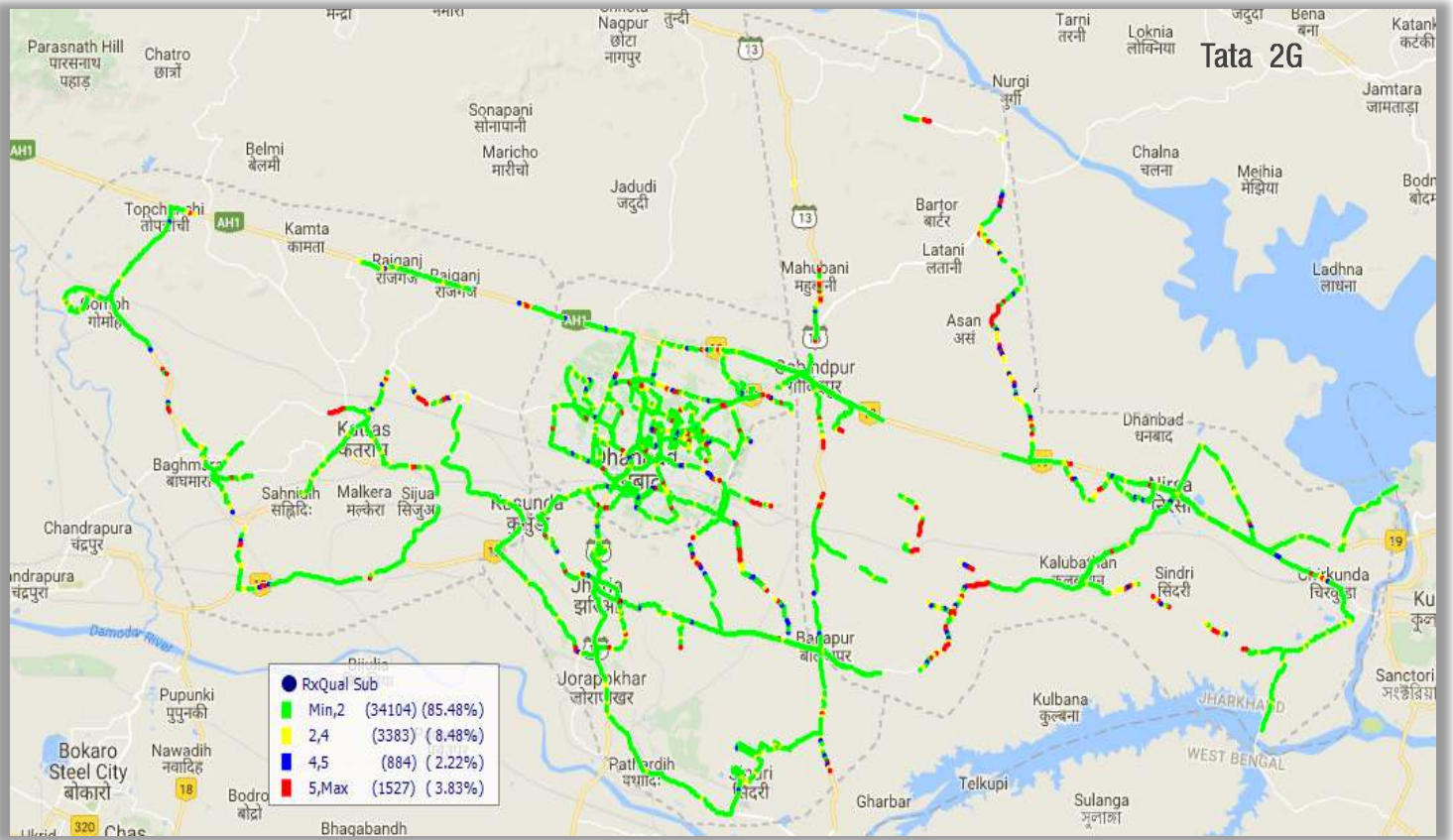
TSP	Rx Quality
Aircel 2G	96.90%
Airtel 2G	95.08%
BSNL 2G	95.85%
Tata 2G	96.17%
Idea 2G	98.16%
RCOM 2G	93.44%
Telenor 2G	96.65%
Vodafone 2G	96.75%
Aircel 3G	94.01%
Airtel 3G	92.89%
BSNL 3G	94.10%
Idea 3G	96.70%
RCOM 3G	88.41%
Vodafone 3G	87.53%
Tata CDMA	88.53%
Jio VoLTE	73.54%



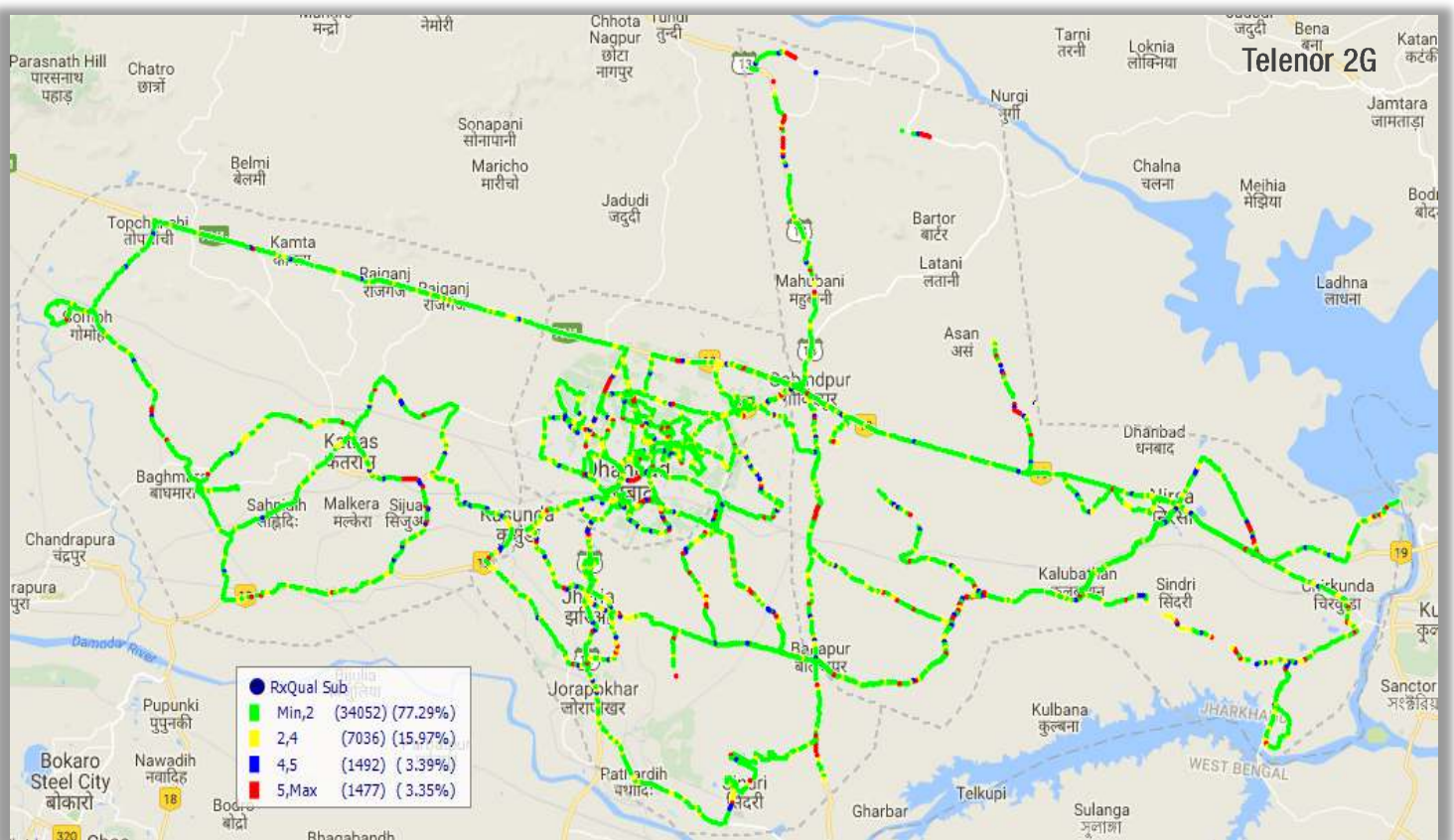
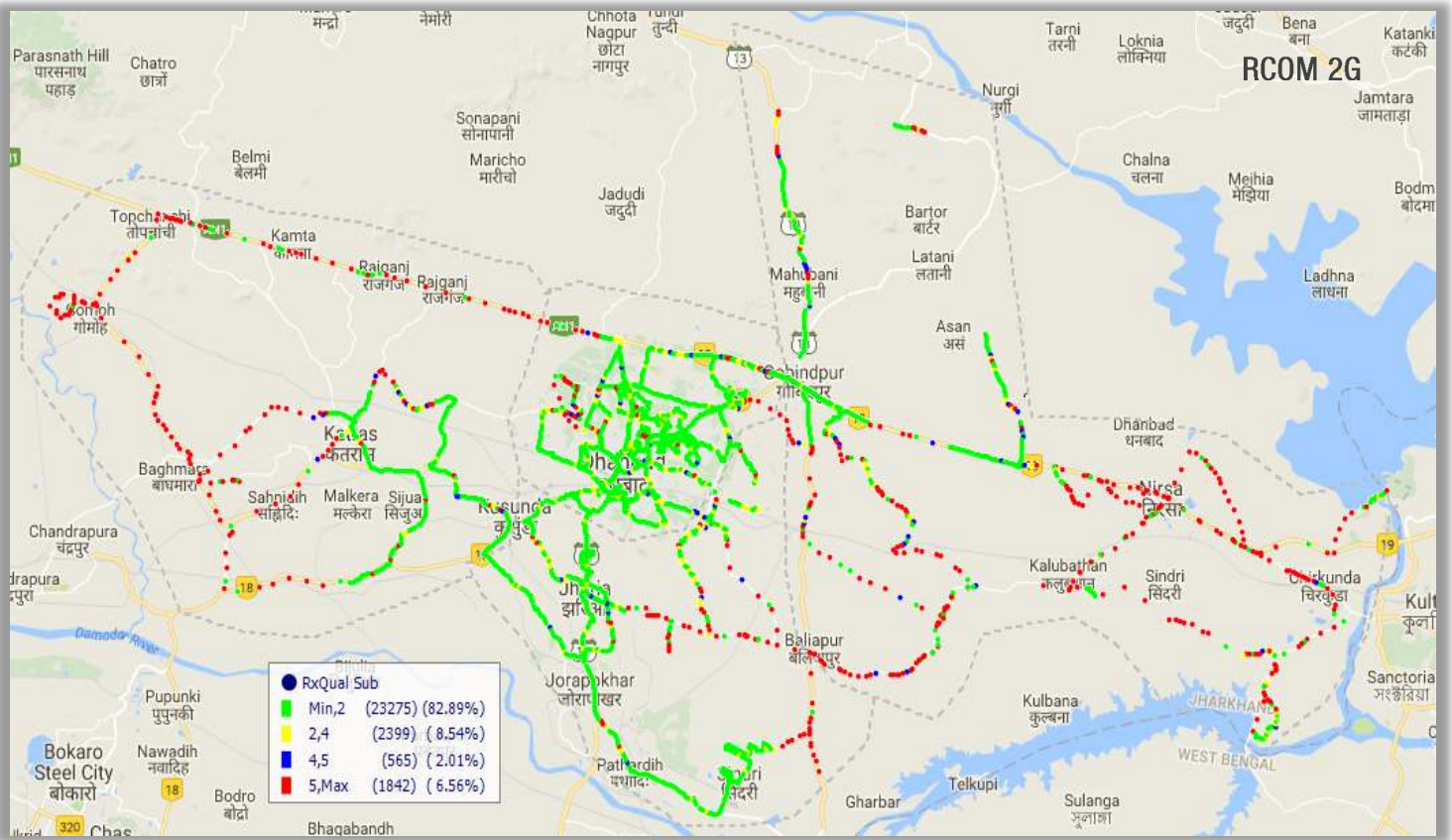
2. Quality Details (contd.)



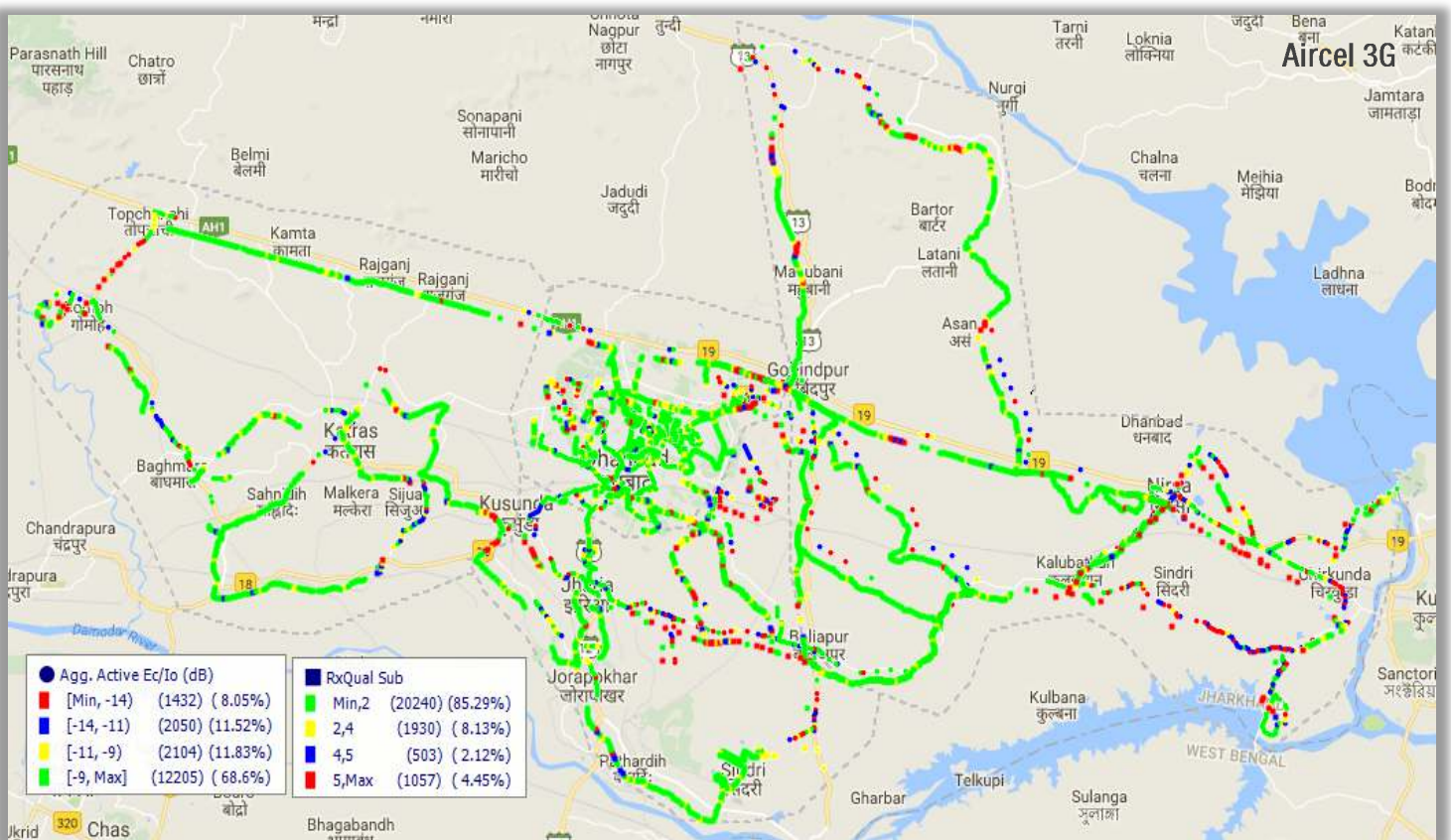
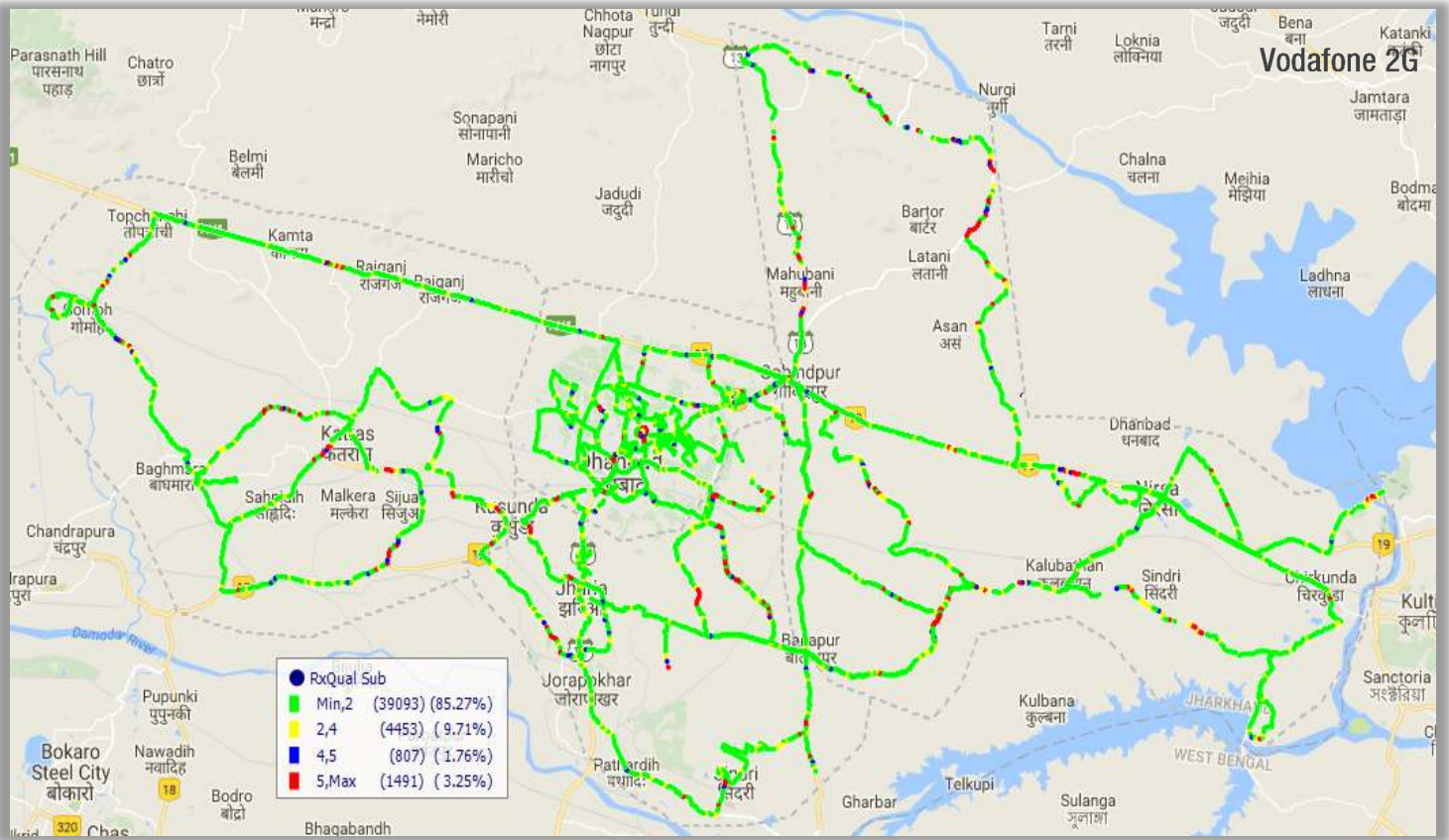
2. Quality Details (contd.)



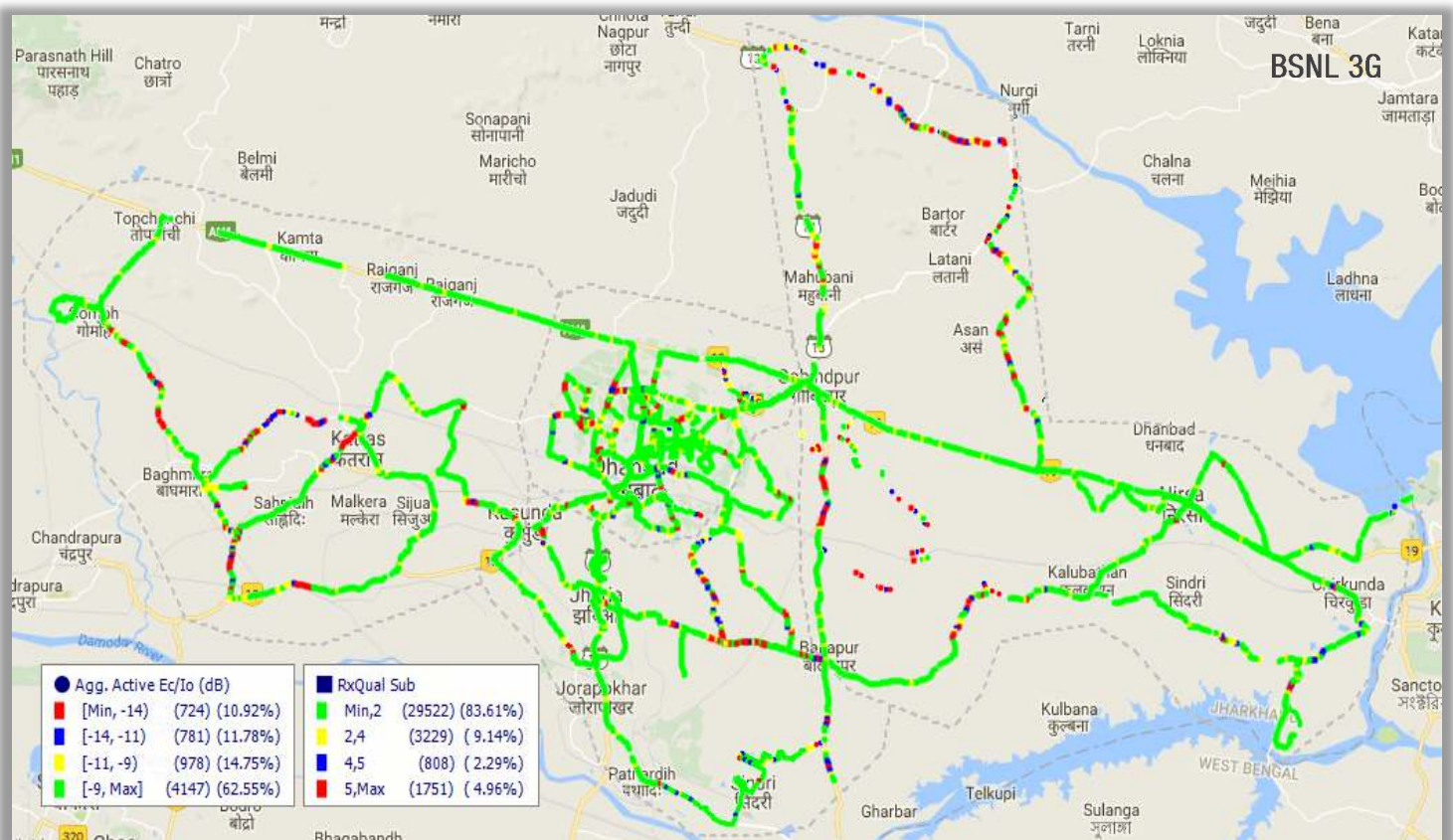
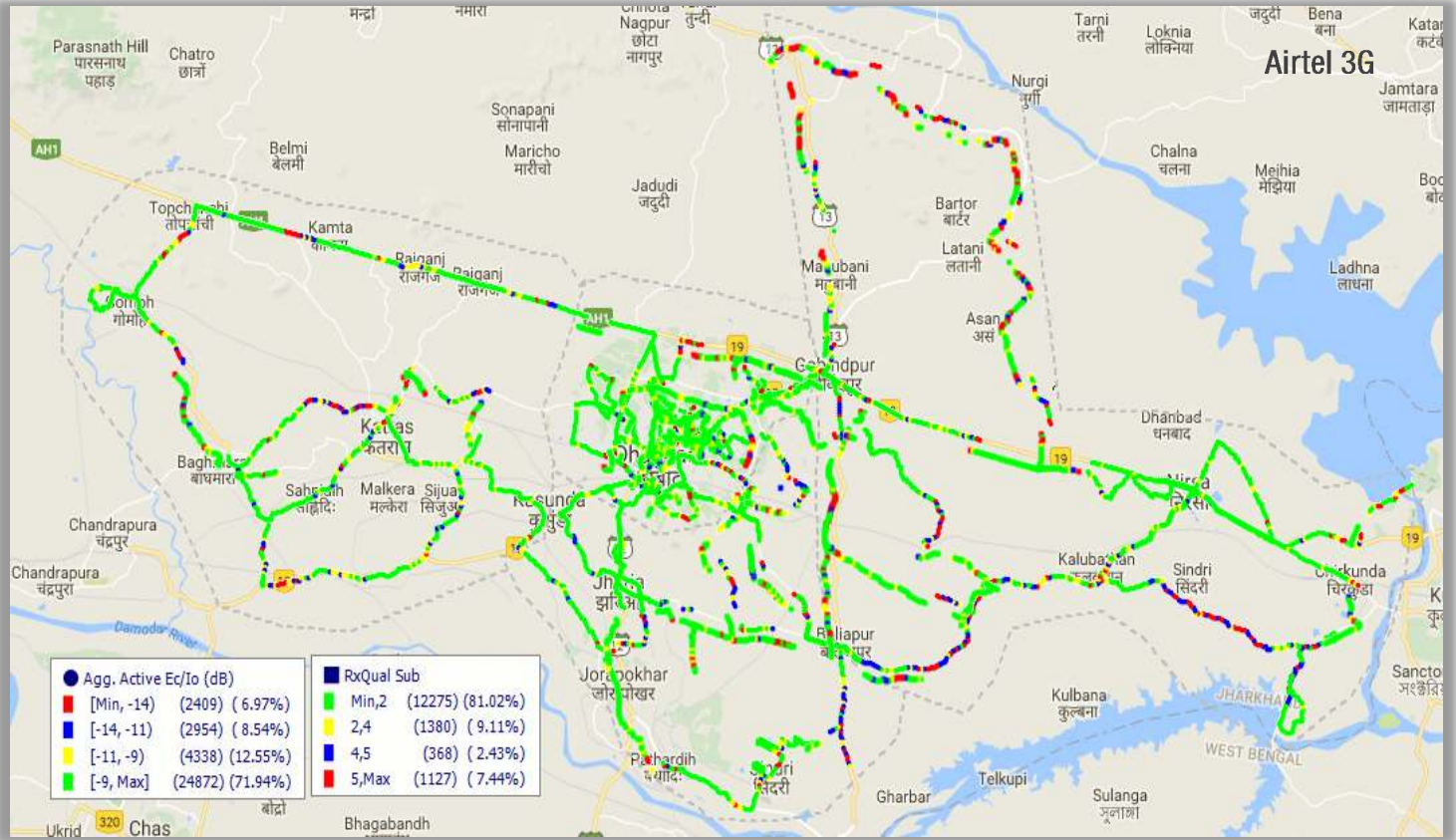
2. Quality Details (contd.)



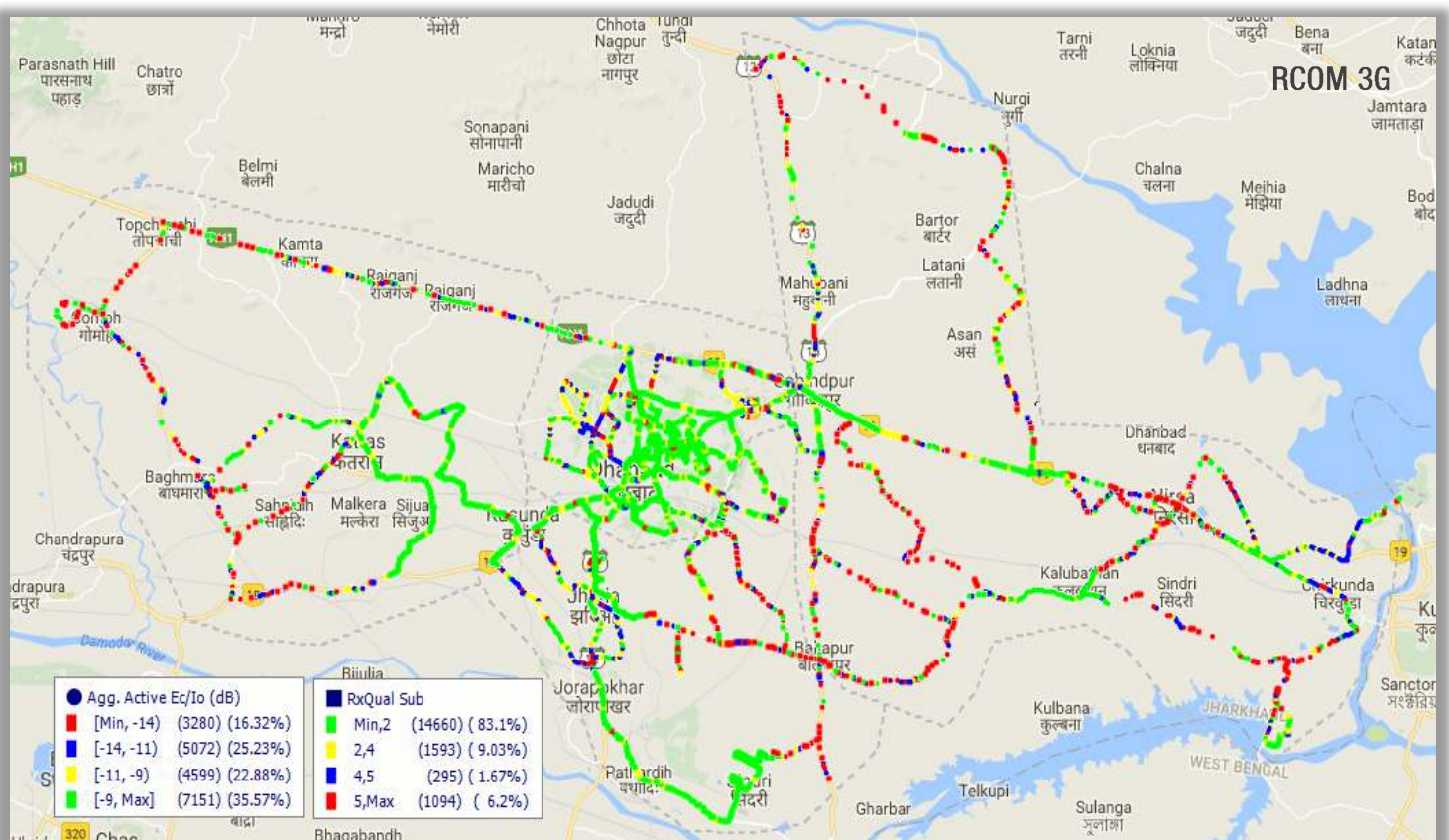
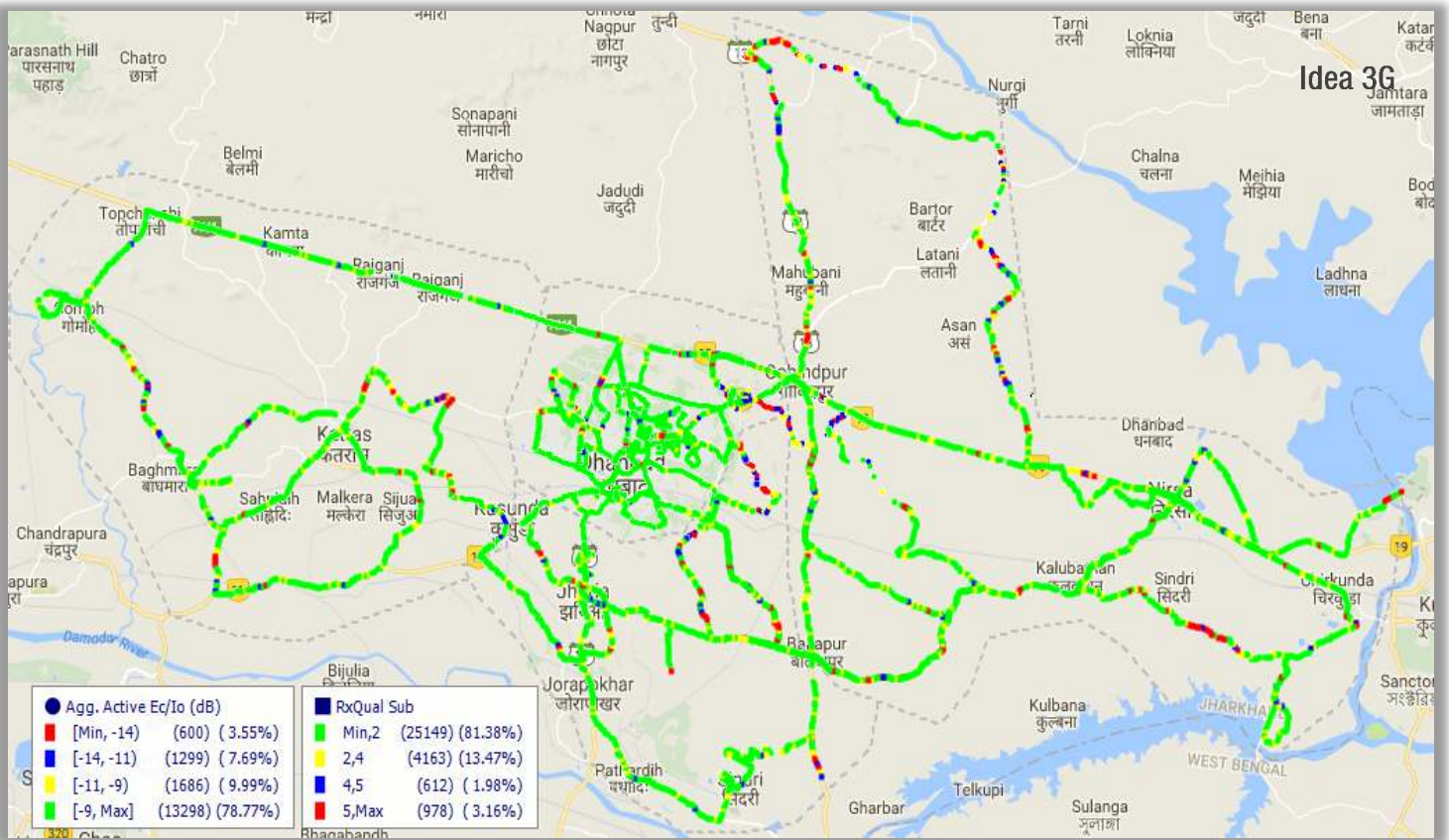
2. Quality Details (contd.)



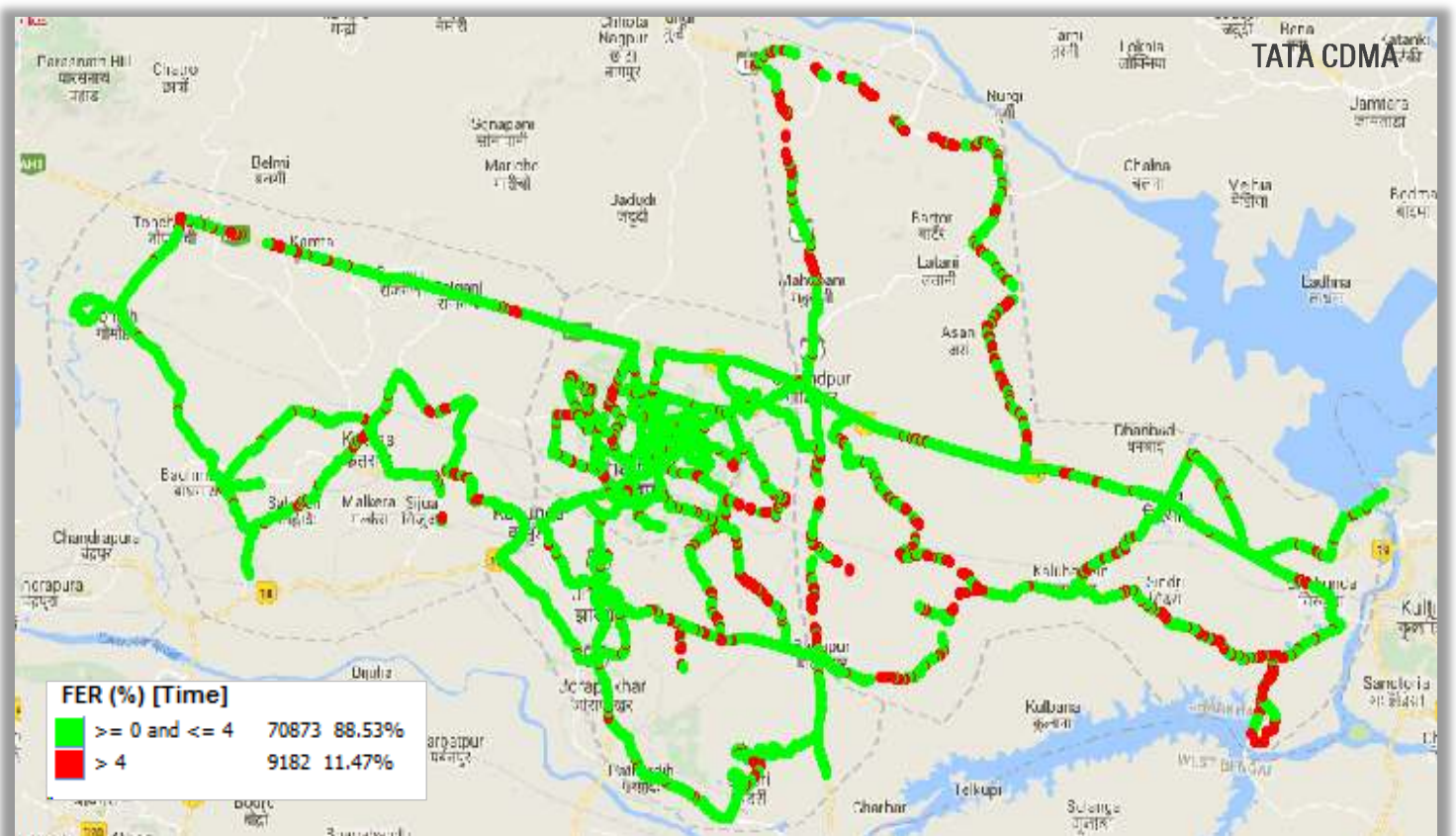
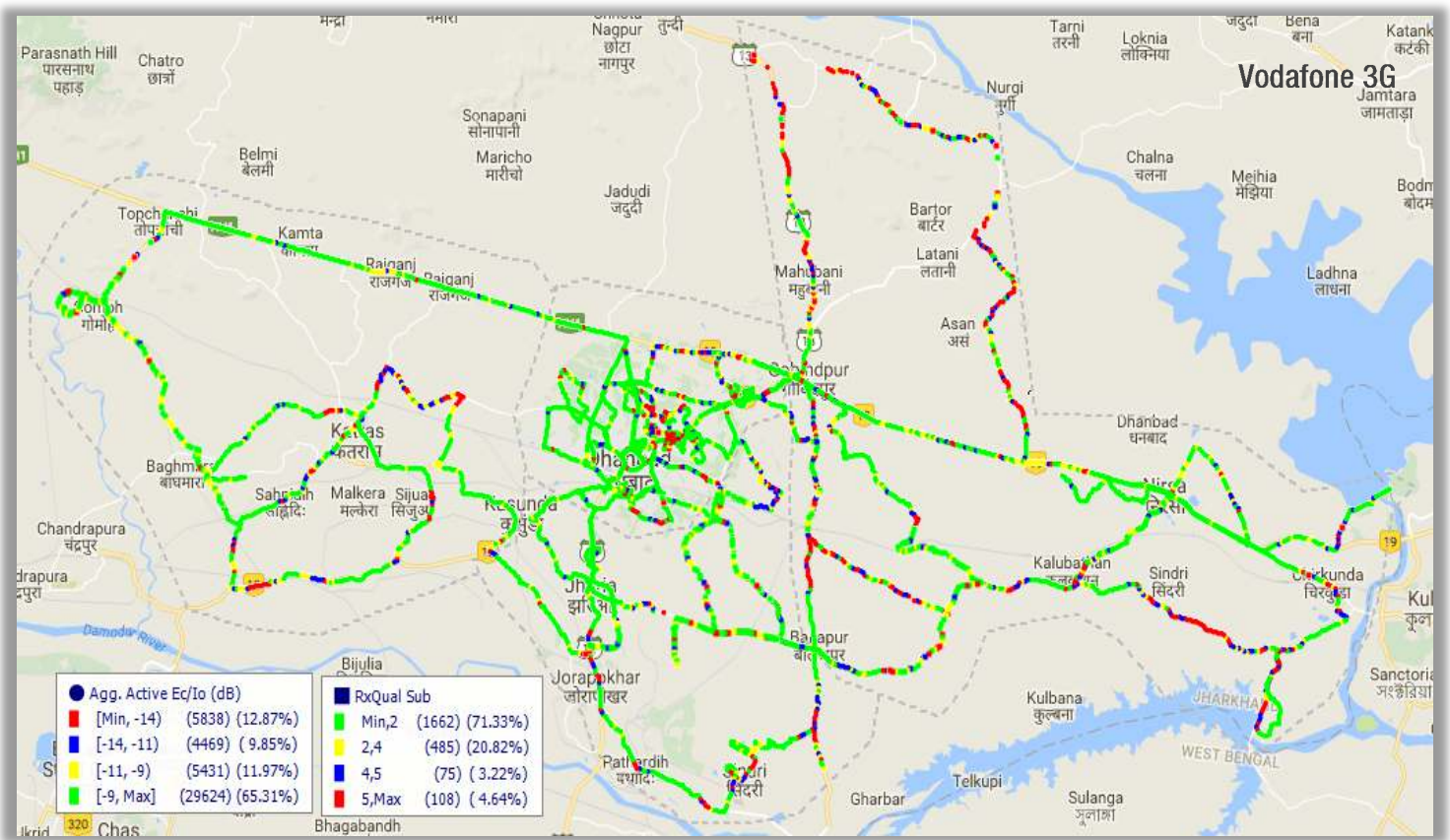
2. Quality Details (contd.)



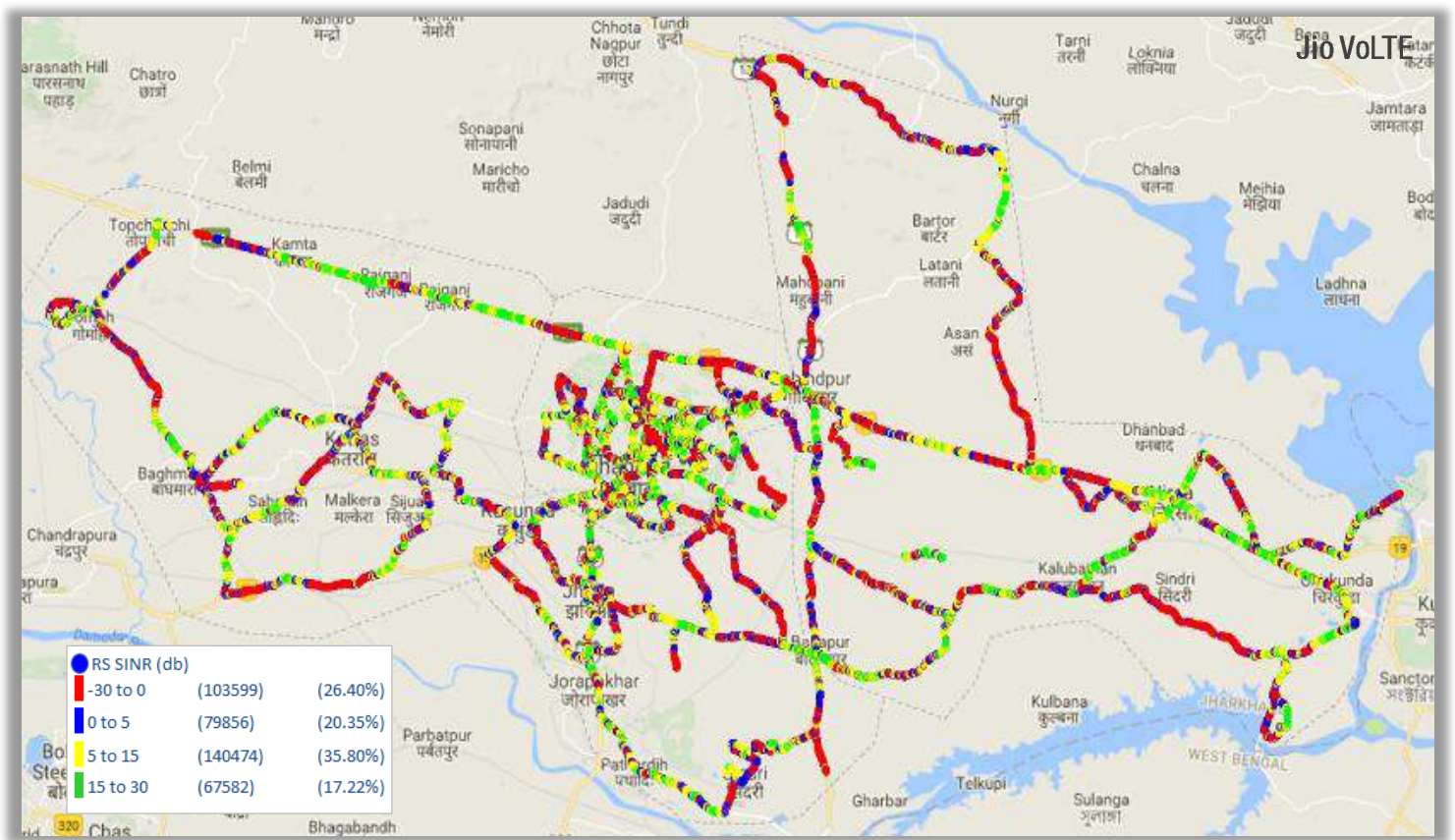
2. Quality Details (contd.)



2. Quality Details (contd.)

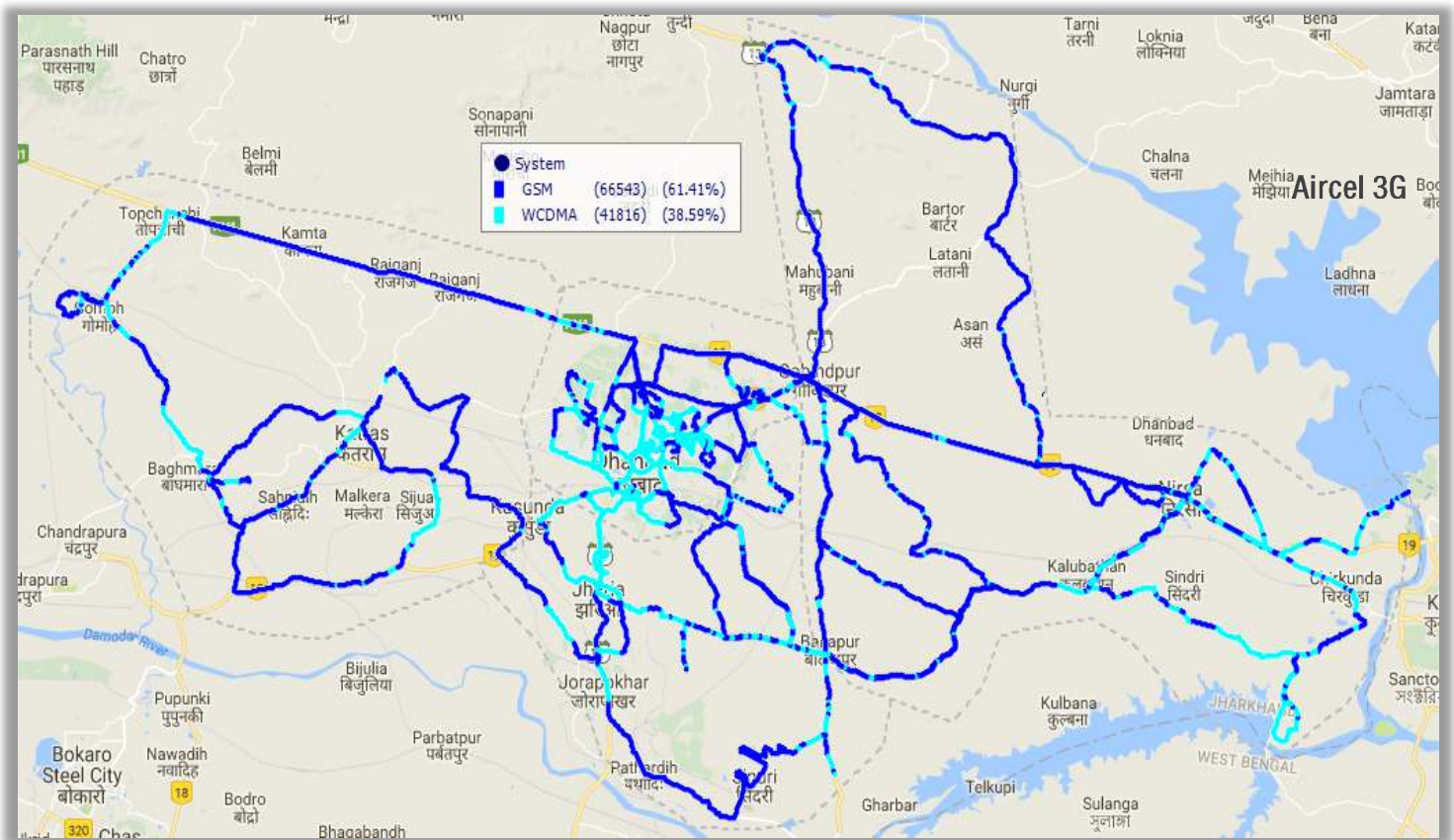
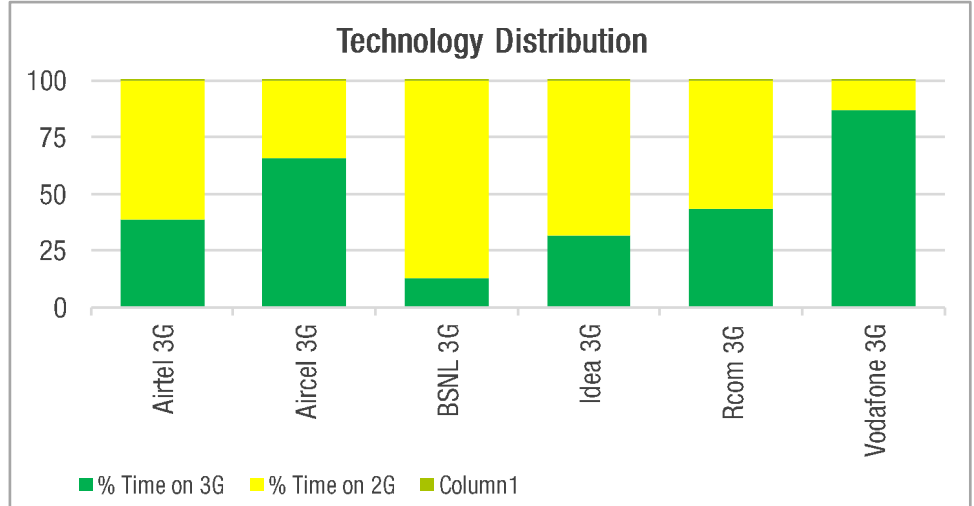


2. Quality Details

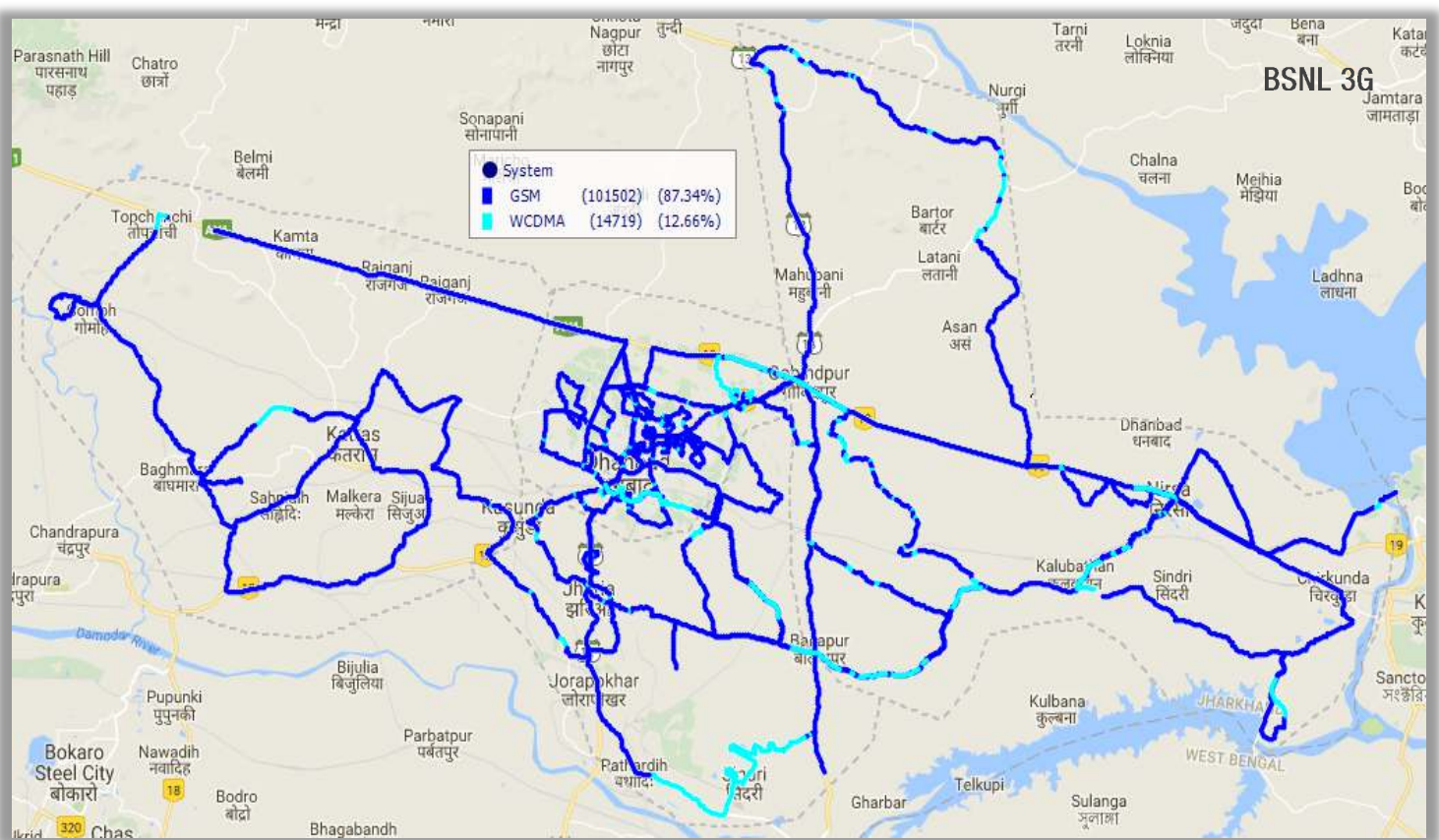
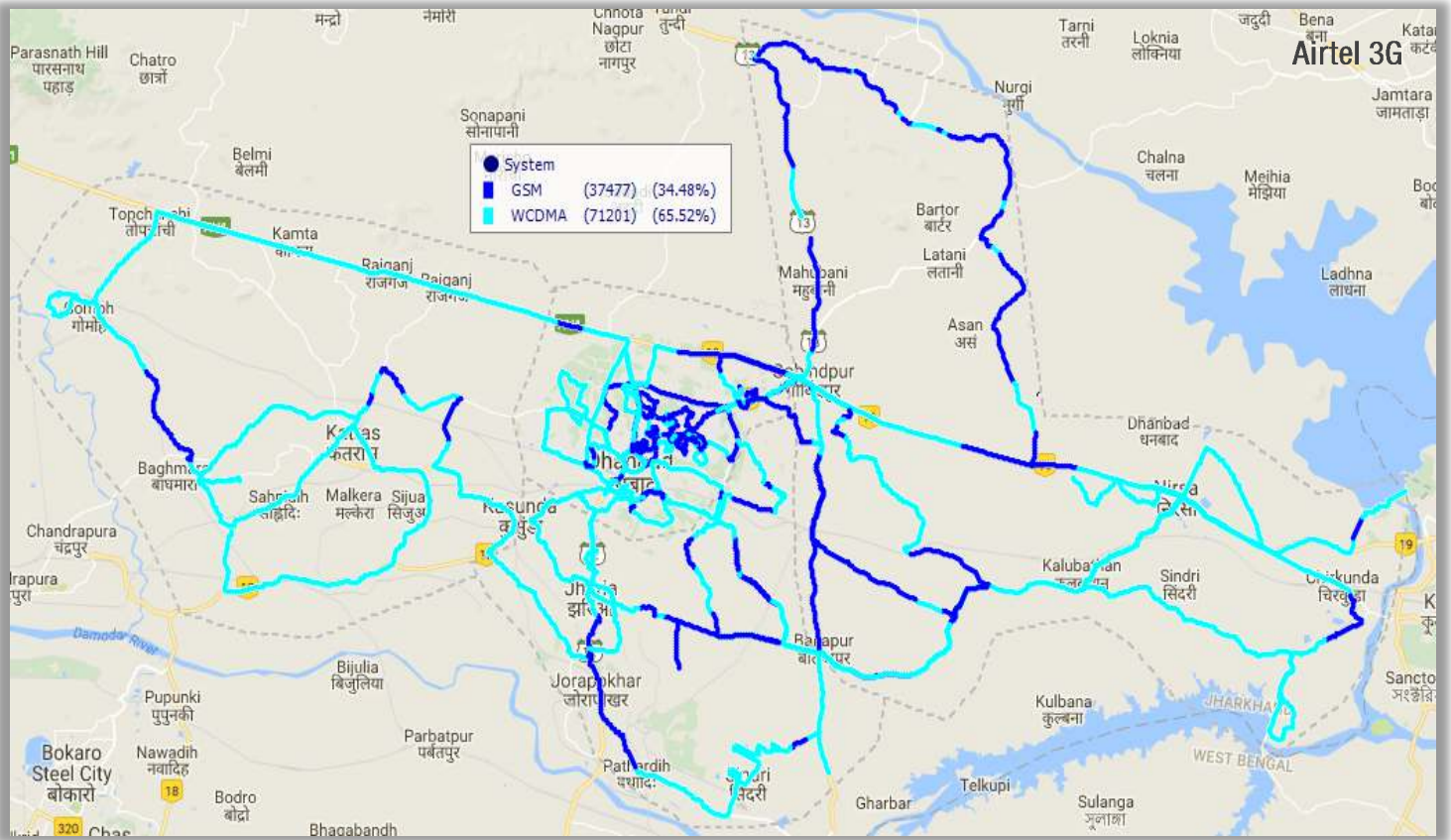


3. Technology Details

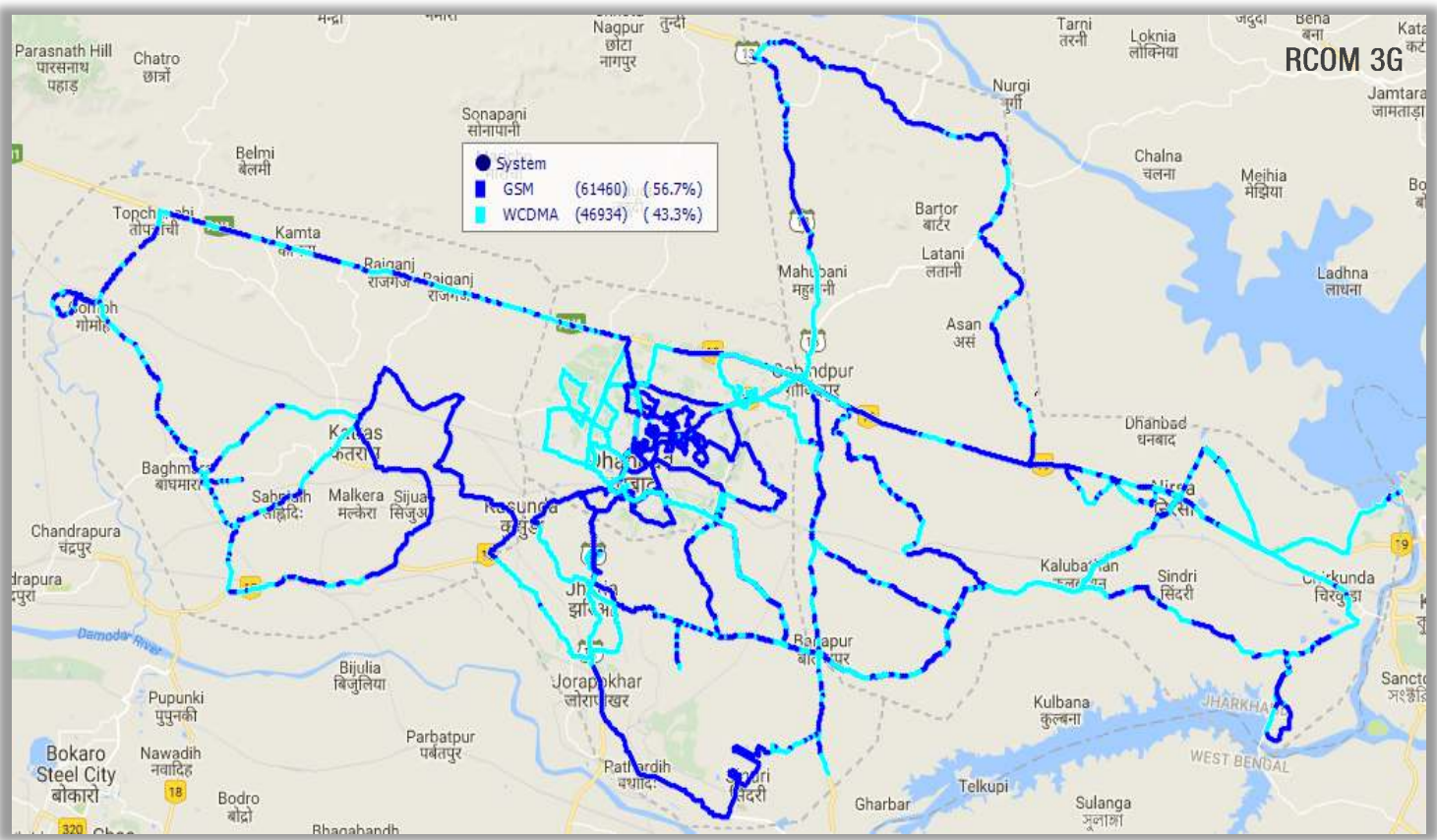
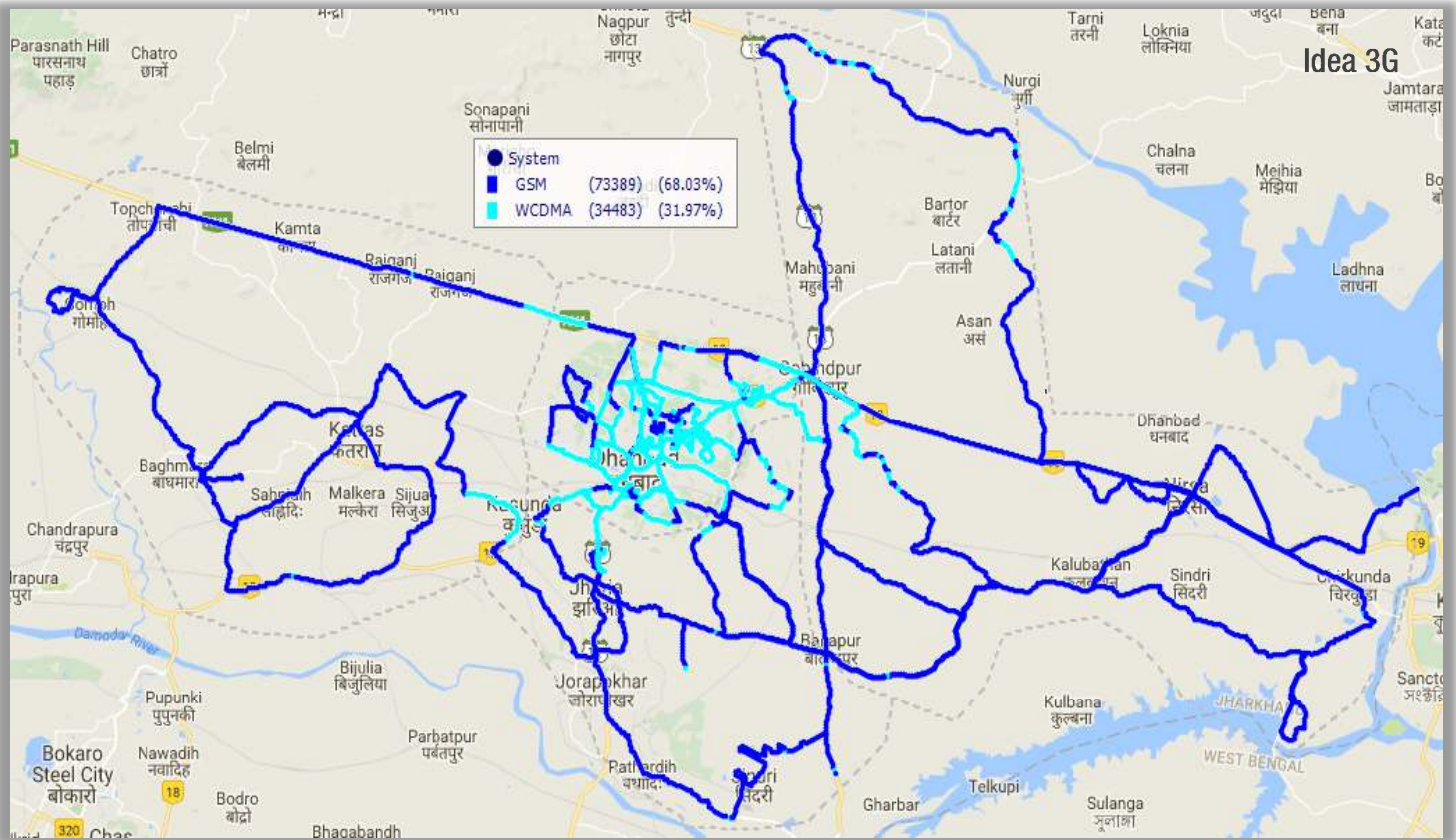
TSP	% Time on 3G
Aircel 3G	38.59%
Airtel 3G	65.52%
BSNL 3G	12.66%
Idea 3G	31.97%
RCOM 3G	43.30%
Vodafone 3G	87.16%



3. Technology Details(contd.)



3. Technology Details(contd.)



3. Technology Details

